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PRODUCTION EDITION

for Manufacturers of Chemicals for Agriculture

MAKING ADJUVANTS—Liquid line at work in plant of Colloidal Products Corp., Sausalito, Cal. See story on page 6.

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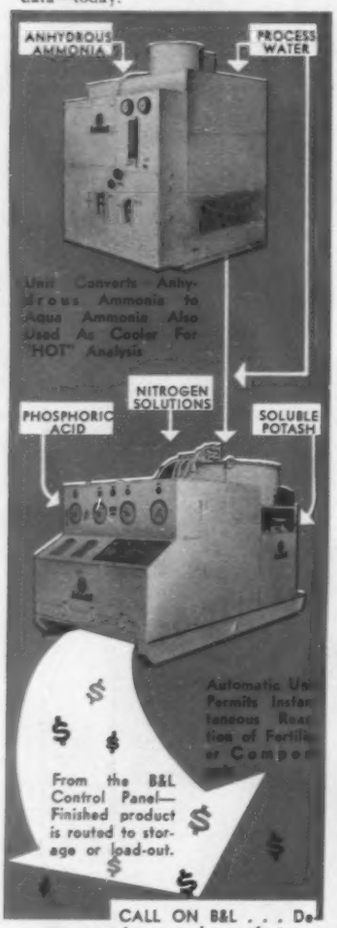

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How Would YOU Figure It?

Costs of Producing Liquid and Solid Fertilizers Told

By H. G. Walkup and N. L. Spencer*
Tennessee Valley Authority

THE FOLLOWING discussion is based on cost estimates made for hypothetical plants for producing liquid and solid mixed fertilizer at four locations. The costs of three ratios of mixed fertilizer appropriate for the areas and produced in the hypothetical plants have been estimated for each site. Primarily, the cost estimates are based on:

(a) Investment in plants at present costs.
(b) Operating plants at current operating costs.
(c) Purchase of raw materials at current market prices.
(d) Conversion of the raw materials into finished products during a specified period of plant operation each year.
(e) Appropriate storage of the finished products at the manufacturing plant.
(f) Distribution from the producer to the farmer (but omitting the cost of application on the farm).

Although much of the solid mixed fertilizer in the Southeast is produced in batch-type plants, a cost analysis pertinent for the future probably should consider a continuous flow process. For this reason a TVA continuous ammoniator process and plant components were considered in developing the plant cost estimate. Since nongranular, relatively low-analysis grades presently utilized in each of the four areas are considered in the production estimates, the dryer, cooler, sizing screen, and recycling equipment usually used in the TVA continuous ammoniator process for producing high-analysis granular fertilizers are not included among the plant components.

The plant for producing solid nongranular fertilizers is estimated to cost $200,000, and to have an annual output of 30,000 tons.

The liquid fertilizer plant assumed for the estimate utilizes a 1,000-gallon reaction tank. Suitable raw-material storage, pumping, and metering facilities are provided along with storage for finished product. The annual output is assumed to be 5,000 tons. Cost of the plant is estimated to be $64,500.

Estimated operating costs for the sol'd fertilizer plants producing 30,000 tons annually are $6.23 per ton for bagged material; the cost of bags represents about $3.00 of this amount. For the liquid mixing plants producing 5,000 tons annually, the operating costs are estimated to be $3.18 per ton.

Distribution costs from the plant to farms is estimated to be $5.00 per ton for both solid and liquid grades.

The formulations chosen for the

Turn to **PRODUCTION COSTS** page 30

TABLE 1—Comparisons of Costs of Solid and Liquid Fertilizers

(Includes costs of raw materials, manufacturing, and distribution to farms.)

	Decatur, Alabama					
Grade	4-12-12	4-12-12	8-8-8	8-8-8	6-8-8	6-8-8
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	25.10	32.58	26.24	29.33	23.03	26.48
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	36.42	40.76	37.56	37.51	34.35	34.66
Total, $/unit	1.30	1.46	1.57	1.56	1.56	1.58

	Moultrie, Georgia					
Grade	4-12-12	4-12-12	5-10-15	4-8-12	6-12-12	5-10-10
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	24.63	34.67	26.26	27.43	27.45	31.23
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	35.95	42.85	37.58	35.61	38.77	39.41
Total, $/unit	1.28	1.53	1.25	1.48	1.29	1.56

	Hopkinsville, Kentucky					
Grade	10-10-10	9-9-9	4-12-8	4-12-8	6-12-12	5-10-10
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	35.37	32.97	25.80	30.80	30.38	29.93
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	46.69	41.15	36.82	38.98	41.70	38.11
Total, $/unit	1.56	1.32	1.23	1.62	1.39	1.52

	Goldsboro, North Carolina					
Grade	5-10-10	5-10-10	3-9-9	3-9-9	8-8-8	8-8-8
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	25.31	32.43	21.04	27.11	28.80	31.49
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	36.63	40.61	32.36	35.29	40.12	39.67
Total, $/unit	1.47	1.62	1.54	1.68	1.67	1.65

[a] For solid fertilizers, the manufacturing cost includes $3.00 per ton for bags.

*Paper presented at Southern Regional Liquid Fertilizer Conference, Eatonton, Ga., Feb. 9-11, 1960.

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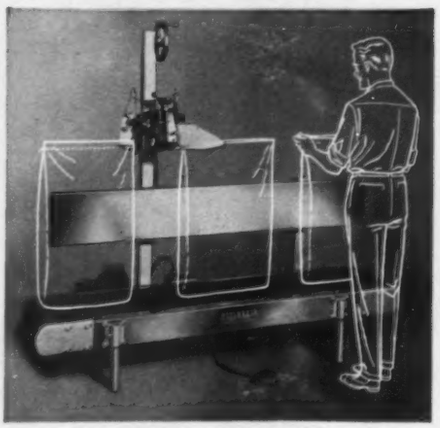

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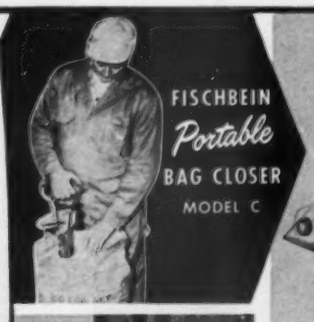

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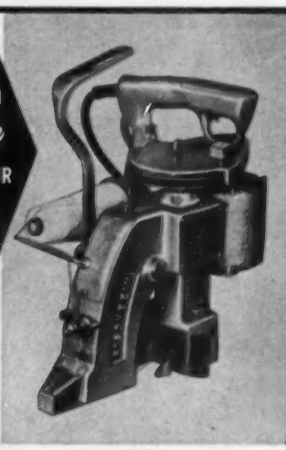

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40th Anniversary . . .

Pesticidal Adjuvants Made by California Firm in Modern Plant

By Godfrey Lehman
Croplife Special Writer

COLLOIDAL OFFICIALS—Ed Littooy, president of Colloidal Products Corp., Sausalito, Cal., left, confers with C. E. Miller, vice president in charge of research and development, and Stanley Strew, vice president in charge of marketing. The firm is observing its 40th anniversary in 1960.

FORTY YEARS of service to the pesticide manufacturing industry is the record of Colloidal Products Corp. of Sausalito, Cal. The firm is observing its 40th anniversary this year.

When established in 1920, the firm was located in San Francisco and was considered an unusual type of business. Since then it has developed right along in keeping with the needs for adjuvants in pesticidal formulations.

Ed Littooy, president of Colloidal, describes his product as a means of improving the effectiveness of pesticidal compounds. This may come about through the use of colloids to stabilize the dispersion of the mixture and surfactants to reduce surface tension of solutions; sometimes it is accomplished by increasing the systemic action of pesticides by helping to penetrate into and translocate within the plant. The adjuvant may soften the wax on a leaf or facilitate entry of the chemical through the stomata; or it may enable two otherwise incompatible liquids to be blended into a homogenous mixture which, in turn, may become an effective pesticide.

The adjuvant does not change the chemical structure, Mr. Littooy explains, but "develops a mode of action." The chemical spreads, sticks, penetrates or whatever with greater uniformity to permit more even action with the proper adjuvant, he points out.

The recent move of the company from San Francisco to suburban Sausalito was planned largely to permit an expansion in the firm's services, and to leave room for additional expansion later on. In fact a further building program has been scheduled for this year.

The company now occupies a two acre site in the relatively uncrowded area of the Sausalito waterfront. The several buildings will eventually form a large letter "C" around a spacious truck operating area and parking lot.

The main offices, to the right of the driveway, are in a low, one floor building constructed of split faced concrete block, and separated from the factory operations. Directly in line with this building are two structures which house the manufacturing. These two separate corrugated steel buildings measure 40 by 80 feet each.

Located in a section of one of these buildings is the laboratory presided over by Paul M. Ruedrich, director of research for Colloidal.

Across the lot is a building 214 feet in length and 40 feet wide where the dead storage is warehoused—completed and packaged products awaiting shipment, or ingredients and raw materials.

The 1960 building program calls for two more corrugated steel buildings, measuring 40 by 80 feet, for the manufacturing and testing of new products not yet in general production.

It is part of Colloidal's function to develop new formulations for new chemical combinations, and this calls for continuous research, testing, and experimentation. Such research may go on for years before a formulation is added to the company's line of adjuvants. Special research facilities have also been established in Seattle for service to the Pacific Northwest, and close cooperation is maintained between the company and various agricultural research departments of a number of colleges and universities.

The two factory buildings house five separate units for making formulations. Two of these are for dry materials, and three for liquids. At the present time the company makes about five dry formulations and five liquid formulations.

The specially designed equipment and machinery offer no clean-out problem, Mr. Littooy explains. There are no dead corners, no danger that the standard cleaning equipment cannot completely remove the chemicals used in one formulation before the operating units are being prepared for the next.

Mr. Littooy explains that these for-

Turn to ADJUVANTS page 8

VIEWS AT COLLOIDAL—Below, left, is view in area where dry formulations are packaged at Colloidal Products Corp. At present, the company makes five dry formulations. The buildings are constructed to offer a minimum of clean-out problems. At right, below, is Paul M. Ruedrich, director of research for Colloidal, seated at desk in his laboratory at the firm's Sausalito, California headquarters.

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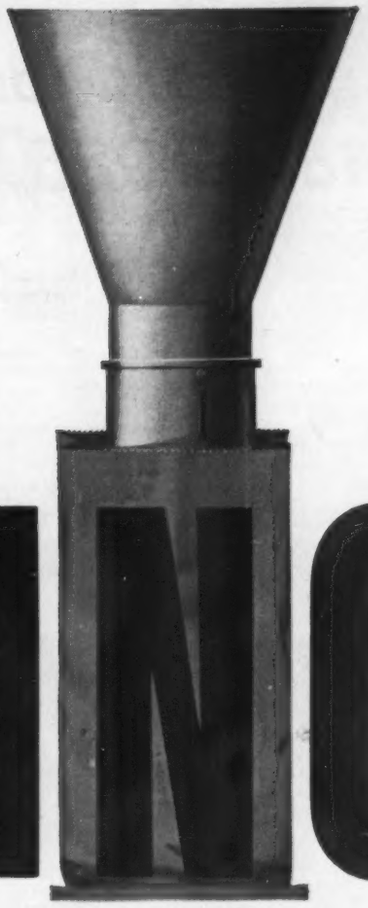

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Fertilizer Situation Told . . .

Supply of Plant Nutrients for '60 Totals 8,085,000 Tons—USDA

WASHINGTON—Supplies of fertilizer materials are expected to total 8 085 000 tons of plant nutrients for 1959-60, according to a report compiled by Harold H. Shepard and staff, of the agricultural chemicals staff, Commodity Stabilization Service, Food and Materials Requirements Division, U.S. Department of Agriculture.

This tonnage is 5 2% higher than the total of 7 685,000 tons available in the 1958-59 year (ended June 30, 1959). The tonnage that year was surprisingly high, Dr. Shepard points out, being 14% greater than in 1957-58.

The report continues: "Despite the increase in total supplies, such factors as the growing complexity of the industry, the need to provide the variety of materials demanded, and the increasing quantity of fertilizers that must be moved in a short period of time, may create apparent scarcities in the midst of plenty.

"Transportation systems are limited in the quantity of fertilizers that can be moved in one day. Plants are limited in the quantity that can be manufactured or loaded on carriers, and because orders for a specific product cannot always be anticipated, stocks may become exhausted. Thus, spot orders, especially orders for anhydrous ammonia, nitrogen solutions, ammonium nitrate, concentrated superphosphate, and phosphoric acid, may go unfilled in some areas during the busiest part of the season. Needs for short items may be magnified when duplicate orders are placed with several producers.

"Estimates of supplies for 1959-60 shown in this report are based on stock trends, rates of production, and foreign trade during the first six months of the fertilizer year.

"Although 70% of sales are made in the last four months of the fertilizer year, from 40 to 55% of primary fertilizer materials are manufactured in the first six months. Production schedules are based largely on sales anticipated by primary producers and mixers as reflected by the attitude of dealers and farmers.

"Rates of production during the first half of the 1959-60 fertilizer year were above those last year and it is believed generally that they will continue so during the last half of the year. Primary producers were strongly optimistic toward mid-year. December production was the largest of any month in the history of the industry for each of the following: anhydrous ammonia, fertilizer grade ammonium nitrate solution, synthetic ammonium sulfate, nitric acid, urea and wet process phosphoric acid.

"Inventories of primary producers, as well as those in other segments of the industry, were depleted last spring when sales exceeded expectations as gauged by production rates. Consequently, the accelerated production last summer was presumed to be for fall sales and rebuilding inventories. Stocks of primary producers at the end of December, however, were still below those a year earlier, except for anhydrous ammonia, nitrogen solutions and normal superphosphate.

NITROGEN

Estimates indicate that supplies of nitrogen for fertilizers in 1959-60 will total 3,071,000 tons of N, an increase of approximately 11% over the previous record quantity for 1958-59.

Ammonium sulfate is in better supply than was anticipated earlier. Production was reduced less as a result of the steel strike than many feared and during the rest of the fertilizer year, it is expected to be at a high level. Producers of synthetic sulfate helped to bridge the gap. Also, exports have been somewhat lower and imports higher this year than last.

Production of fertilizer grade ammonium nitrate solution continues to climb—enough to provide increased supplies of solid ammonium nitrate, of ammonium nitrate solution, and of ammonium nitrate-limestone mixtures. The increase may be greater than is reflected in statistics on production because less of the quantity going to non-fertilizer purposes is being classified as fertilizer grade ammonium nitrate.

Ammonium phosphate produced for shipment as such will reach a new high level in 1959-60.

Liquid nitrogen supplies will again reach a record level, rising to about 61% of the domestic supply of nitrogen. In every month from July through December, anhydrous ammonia production was at a record high for that month, and December production was the largest ever for any month.

Production for July through December was 21% greater than in the same period in 1958. Indications are that anhydrous ammonia (including aqua) supplies for fertilizer use will be increased about 98,000 tons of N in 1959-60 and supplies of nitrogen solutions will rise even more.

Domestic production of urea is at a rate of about 35,000 tons of N ahead of last year. About 24,000 tons of this will be fertilizer grade, liquid and solid. Urea import data have been adjusted to allow for estimated quantities going into non-fertilizer uses. Exports are expected to be down to somewhat less than half those of last year. One domestic producer is reported to have withdrawn from the export market during the current fertilizer year.

Currently, 58 anhydrous ammo-

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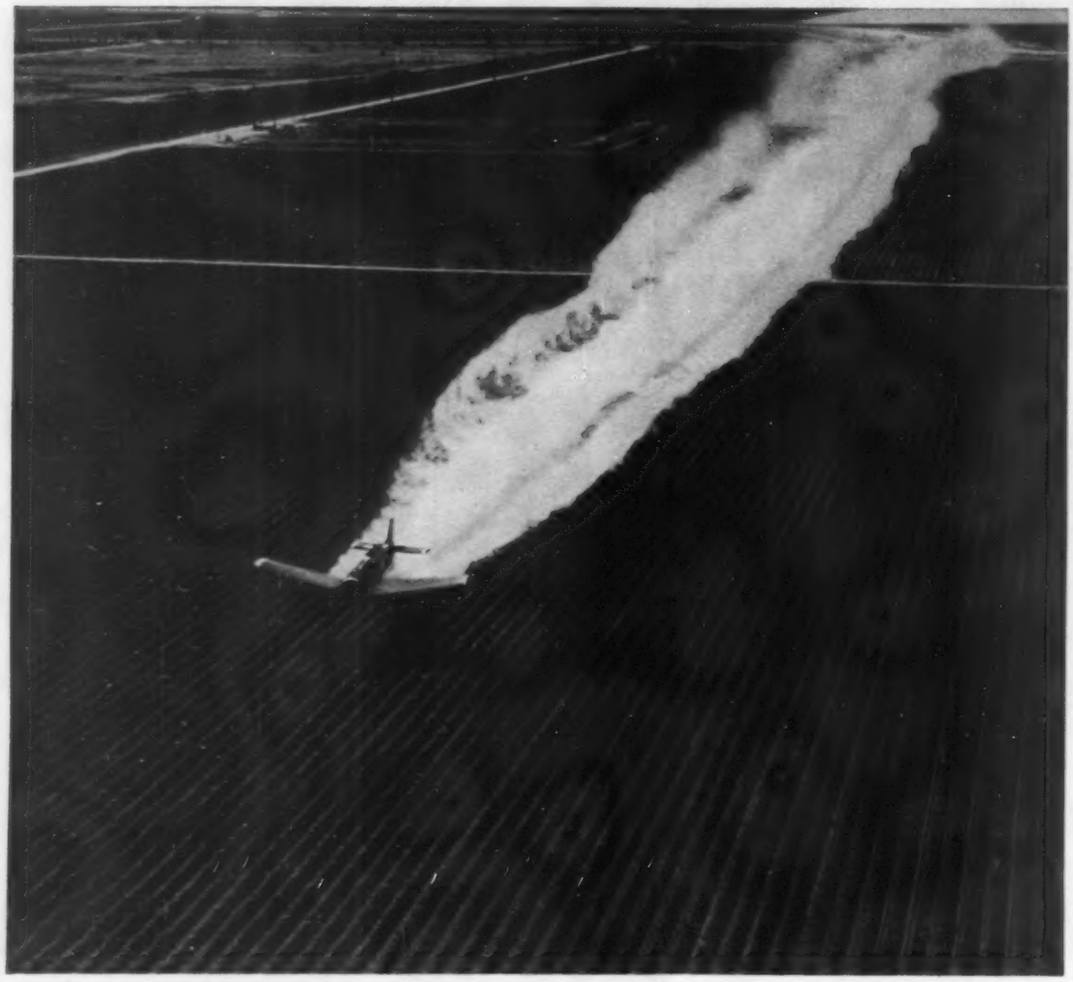

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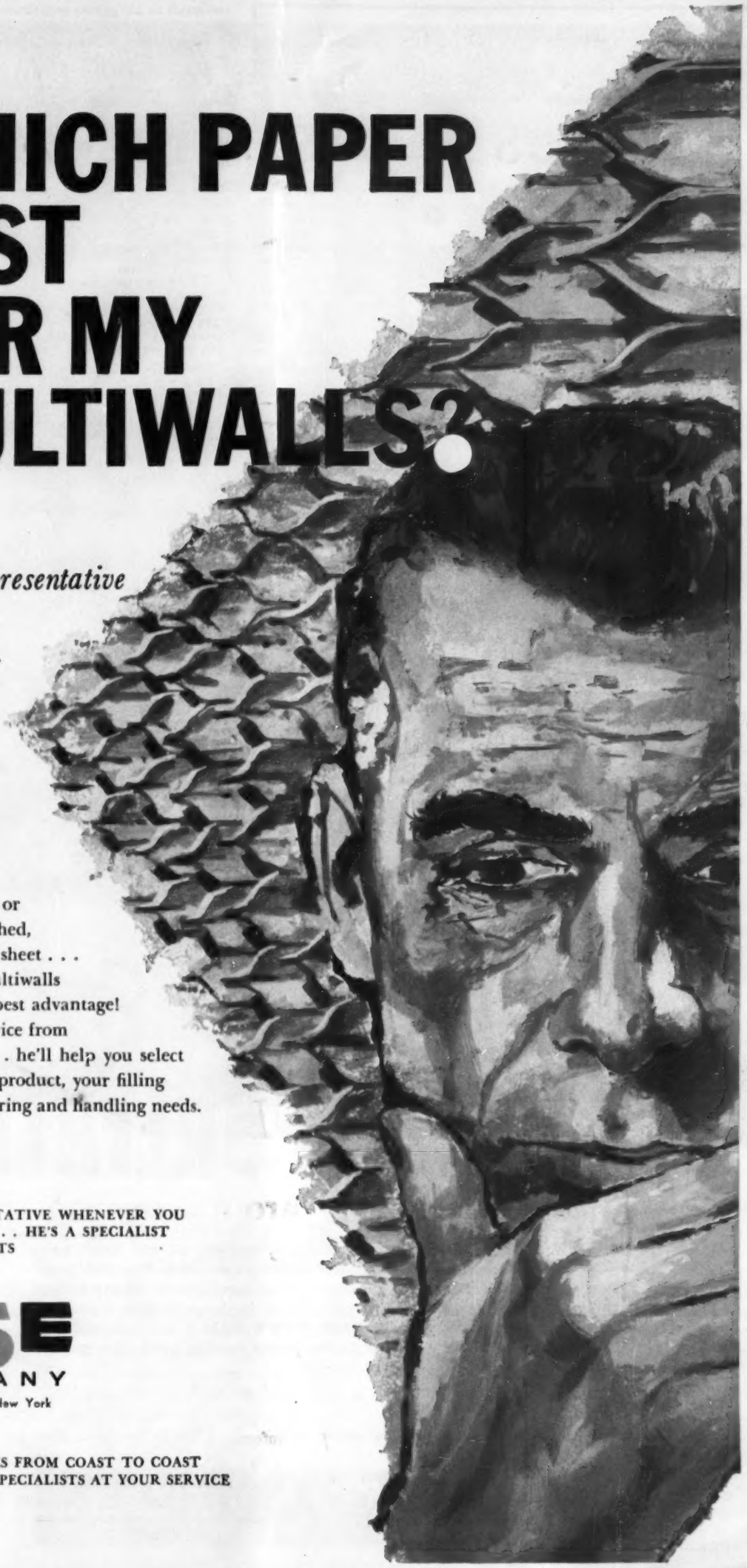

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ADJUVANTS

Continued from page 4

mulations are not added to a chemical during its manufacture as an insecticide, pesticide, fertilizer, or whatever. The adjuvant is added at the time of application—to the tank of the sprayer or dispersing equipment.

For the most part, the company does not sell to the applicator under the Colloidal name. The pesticide manufacturers supply their own labels to Colloidal, and in packaging the adjuvants the company places its customers' labels on standard containers.

Dry goods are packaged in one pound containers, which in turn are packed in 25 and 50 lb. cartons. Liquids are poured into pints, quarts, gallons, or five gallon cans. The most popular size is the gallon, packed six to a carton.

Although the labels use the family design from the chemical manufacturer, the copy appearing on them has been prepared by Colloidal.

To date, some 300 formulations have been researched and tested. Of these, only about ten are deemed valuable and developed enough for actual production. Grants are made to such universities as Oregon State, California, Washington, Texas A&M and others to support assistance to students in the field of agricultural chemicals.

Although only a very small quantity of adjuvant need be added to the chemical upon application—around one quart to 100 gallons of solution—the result, Mr. Littooy explains, is to increase the effectiveness of a chemical.

Research shows that defoliant activity is stepped up; insecticides control pests more thoroughly; weeds are more effectively killed; or liquid fertilizers more uniformly distributed. The adjuvant used is different in each case.

The newest product to be introduced is known as "CPG," and it has been developed to keep 2,4-D and nitrogen from separating in fertilizer solutions. "CPG" has also been found effective for nemagon-fertilizer combinations, Mr. Littooy explains.

Mr. Littooy joined the firm when it was only five years old. He was a salesman for ten years, and became sales manager in 1935. In 1945 he was elected vice president, and for the past four years has been president.

Other officers, in addition to Mr. Ruedrich, research director, include C. E. Miller, vice president in charge of research and development; and Stanley Strew, vice president in charge of marketing. Frank A. Brown, the founder of Colloidal, contributes his experience and guidance as secretary-treasurer.

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Becomes Chief Industrial Engineer for Potash Firm

CARLSBAD, N.M.—Lewis A. Phillips has been appointed chief industrial engineer for the Carlsbad (N.M.) potash operations of United States Borax & Chemical Corp., it is announced by Earl H. Miller, resident manager.

Mr. Phillips formerly was associated with Ethyl Corp. of Baton Rouge, La., serving as time and methods engineer and as engineering economist. He holds a bachelor of science degree in chemical engineering from the University of Kansas and has performed graduate study at Louisiana State University. He is a member of the American Institute of Industrial Engineers, Alpha Chi Sigma, Phi Lambda Upsilon, Sigma Tau, Tau Beta Pi and Omicron Delta Kappa fraternities.

New Warehouse Planned By Borden Chemical Co.

FREMONT, CALIF.—The Borden Chemical Co., manufacturer of a high nitrogen fertilizer, will build a new warehouse in Fremont, suburban to Oakland, Calif., possibly starting toward the end of the current year.

The warehouse is expected to house the firm's Borden's "38," so-named because it contains 38% nitrogen.

Currently the fertilizer is being warehoused in Los Angeles, and distributed from that point to northern California customers. Charles Matzen of San Rafael is consumer products salesman in the area handling the nitrogen product.

Plans, as yet not completely formulated, are likely to call for completion of the building sometime during 1961. It would be located adjacent to a new manufacturing plant for non-agricultural chemicals which is expected to be completed before the new warehouse would be built.

Monthly Sulfur Output Shows 7% Increase

WASHINGTON — Production of Frasch and recovered sulfur in December, 1959, amounted to 470,986 long tons, or 7% more than the corresponding month in 1958, reported the Bureau of Mines, U.S. Department of the Interior.

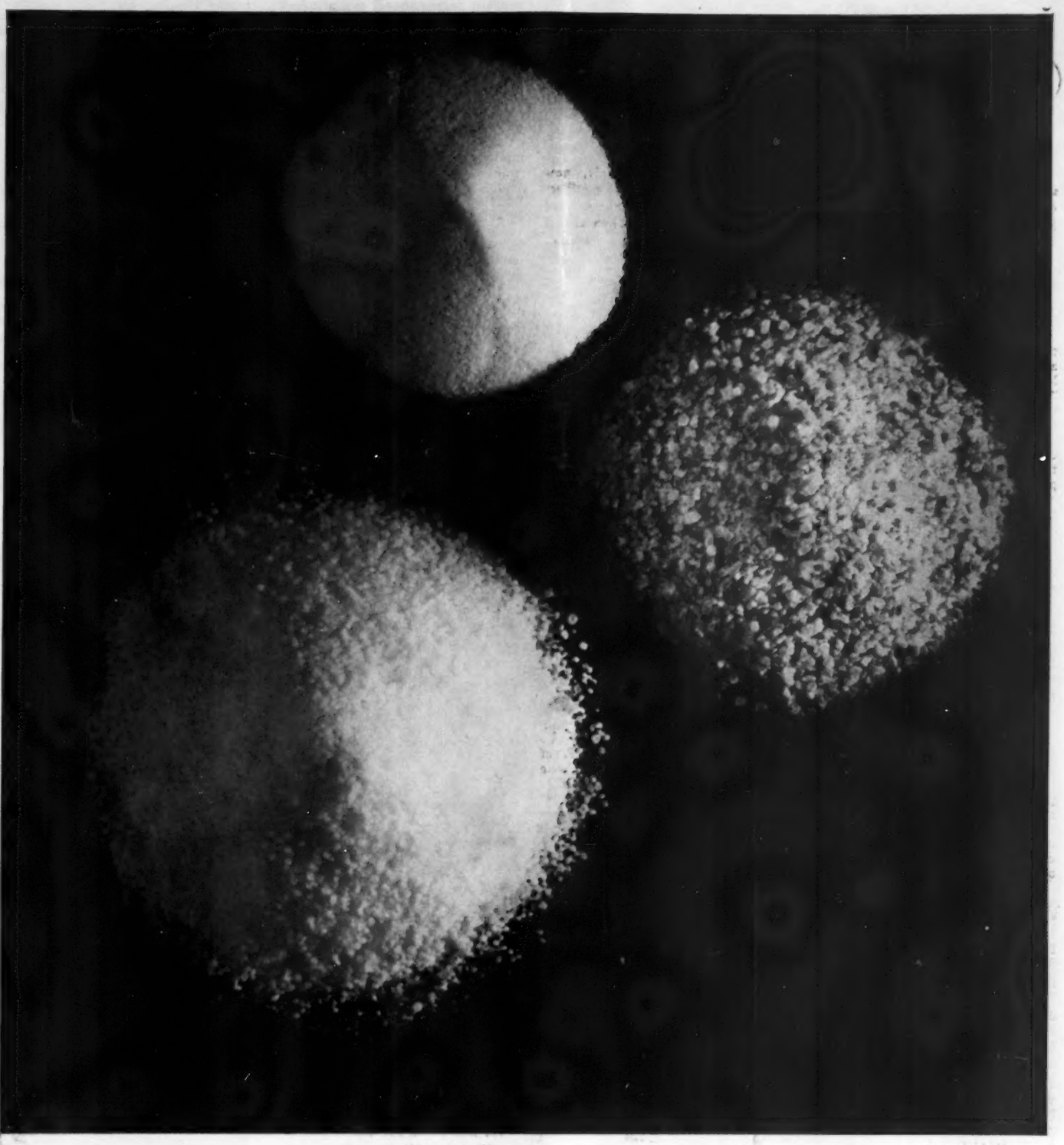
Totals for the year indicated that the output of Frasch sulfur declined 2%, while the output from plants recovering elemental sulfur from natural and refinery gases increased about 5%, USDI said.

Significant reductions were made in the stocks of Frasch and recovered sulfur as shipment exceeded production by approximately 700,000 tons.

Imports of sulfur, mainly from Mexico, increased from 755,000 long tons in 1958, to 800,000 long tons in 1959.

Record Sulfur Shipment

NEW YORK—Sulphur Export Corp., overseas sales agency for U.S. sulphur producers, announced the completion of the loading of the largest single sulphur shipment ever made. The sulphur is destined for Rotterdam and Hamburg. A record 20,900 long tons of 99.98% pure bulk sulphur were loaded on board the new Norwegian vessel H. L. Lorentzen by Freeport Sulphur Co. at Port Sulphur, La., on the lower Mississippi River. The previous record shipment of 18,355 tons was made by the same company in 1958.



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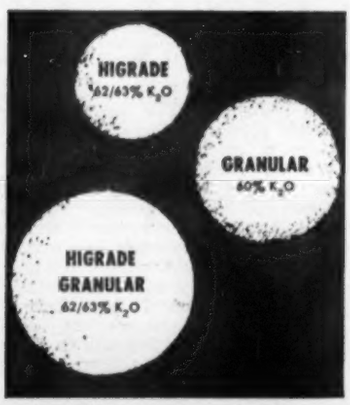

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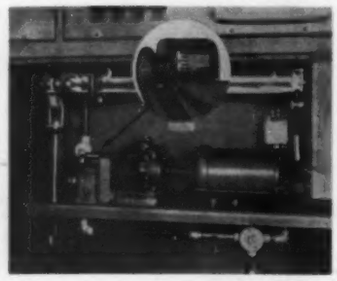
Additional information is available about new products, new services, and literature described in this department. Circle the numbers of items on which you desire more information, fill in your name, your job title, your company's name and address on the card. Then clip it out of the page and mail. No postage is necessary.

No. 9189—Brochure on Attapulgite

The availability of a brochure on the manufacture and applications of attapulgite has been announced by Magnet Cove Barium Corp. Entitled "Attapulgite Products for Industry," the publication outlines the uses of the material in agricultural pesticides, and other applications. Much of the brochure is devoted to the properties of the company's attapulgite products processed for use by insecticide formulators and petroleum refineries, including V.M., screen sizes, sorptive capacity and bulk density. Charts list the granules per pound of the various screen sizes and give typical formulations of various toxicants. For copies, check No. 9189 on the coupon and mail.

No. 9193—Rotary Counter

A recording device for use in a materials feeder system has been announced by Durant Manufacturing Co. The Model D-6 Rotary Counter



features a minimum backlash, good visibility, oil-less bearings and stainless steel shafts, the company says. The counter is a non-reset model to prevent error in reading and any possible loss of record. It is driven from a lead screw which has a known weight per revolution, and by chain and sprocket of correct ratio to the lead screw to record the weight of materials being discharged from the feeder, the company says. Using this counter in conjunction with the automatic flow control, a record is made of the number of turns the lead screw has made, and the exact amount of material that has been fed can be accurately measured to correct any degree of over or under feed. For details, check No. 9193 on the coupon and mail.

No. 9194—High Capacity Sifter

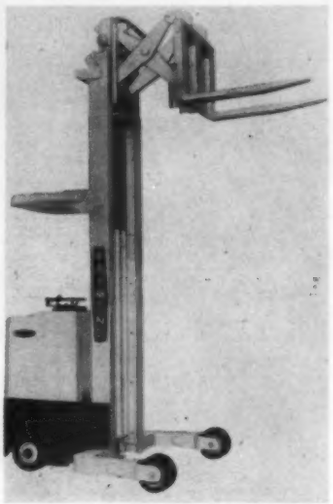
Sprout, Waldron & Co., Inc., announces a re-designed sifter for extremely high capacity accurate sifting of dry materials. The "Super Sifter" design features square, tubular, horizontal cross members in the structural frame. The number of the cross members has been increased permitting the unit to operate under severe industrial requirements, the company says. Further information, including weights and dimensions, can be obtained by checking No. 9194 on the coupon and mailing.

No. 9190—Formulator Booklet

Bowman Feed Products, Inc., offers to pesticide formulators information on opportunities for producing enzymatic products for septic tanks and drains which in turn may be marketed to the sanitary chemical industry. Such a manufacturing setup may be established as an adjunct to the pesticide business, Bowman indicates. For full information check No. 9190 on the coupon and mail to this publication.

No. 9191—Electric Truck

A heavy duty, narrow aisle electric truck is now being offered with a single drive wheel and offset caster by Raymond Corp. This supplements the original model introduced last year with dual drive. According to company literature, the development of the single wheel drive enables it to sell the model at a lower price,



while retaining most of the features of the original unit. Both trucks are designed for applications requiring fast lifting speeds and continuous operation handling loads up to 4,000 lb. The hydraulic lift is driven by an 8 h.p. motor operating from a 24 volt battery. A separate motor furnishes power for the hydraulic circuit controlling the "reach fork" mechanism. For more information, check No. 9191 on the coupon and mail.

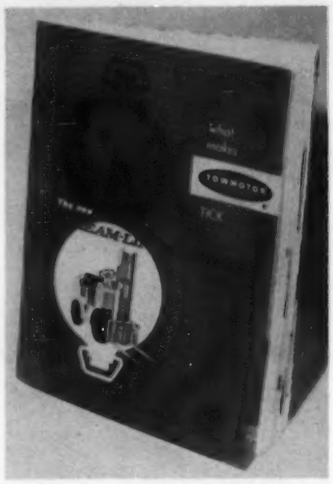
No. 9195—Conveyor Chain Handbook

An illustrated manual compiled as a comprehensive engineering reference book for use in the selection of chain for conveying and elevating has been announced by Moline Malleable Iron Co. Correct application of chains to conveyor systems, development of attachments to increase

their versatility and factors in selecting chains are outlined and illustrated. Also included are comparison charts containing principal features of the most popular types of chains, graphs of friction coefficients and other data correlated to provide a concise reference for the design engineer, the company says. Installation tips, maintenance pointers and a trouble shooting chart are also included. For copies, check No. 9195 on the coupon and mail.

No. 9196—Lift Truck Booklet

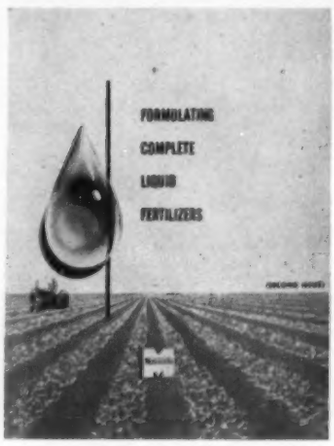
The "Stream-Liner" series of fork lift trucks produced by Towmotor Corp. are covered in a 24-page booklet entitled "What Makes It Tick?" recently released by the company.



Described in detail are operating features, design features, capacities and specifications. Copies of the booklet can be obtained by checking No. 9196 on the coupon and mailing to this publication.

No. 9192—Formulation Booklet

Monsanto Chemical Co. announces the availability of a booklet called "Formulating Complete Liquid Fertilizers." The booklet contains sections on "Saving Money with Acid Neutralization," "Setting Up an Acid



Neutralization Plant," "Examples of Liquid Fertilizer Formulations," "Formulations Using 8-24-0 Solution as P_2O_5 Source," "Densities of Liquid Fertilizer Formulations," and "Applying Liquid Fertilizers." The easy-to-read publication is illustrated with drawings and charts. Copies can be obtained by checking No. 9192 on the coupon and mailing.

No. 9197—Air Compressor

Announcement has been made of the availability of a line of lightweight portable, oil-free, piston-type Winslow Air Compressors by the Winslow Manufacturing Corp. According to company literature, the design of the compressor insures maintenance-free operation by eliminating lubrication and diaphragms that rupture. The non-lubricated pistons include a specially compounded Teflon cup backed up by a silicone O-ring. The compressors are self-contained, ready to plug into an electrical outlet to supply filtered, high

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- ☐ No. 9194—High Capacity Sifter
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pressure air which builds up in seconds, the company says. An automatic safety bleed off valve is available

to release pressure in excess of preselected amounts up to 100 psig. For more information, check No. 9197 on the coupon and mail.

No. 9198—Masking Agents

P. Robertet & Cie is offering masking agents for insecticides, fertilizers and pest controls. The products effectively odor-mask chemical odors and add a pleasing fragrance, the company says. Samples and a booklet are available by checking No. 9198 on the coupon and mailing to this publication.

William M. Creasy Dr. S. Z. Avedikian

Lummus Company Adds To Technical Staff

NEW YORK—William M. Creasy—Major General, U.S. Army Retired—a vice president of the Lummus Co., New York, has been appointed manager of the company's New York division. At the same time, Dr. S. Z. Avedikian is joining the Lummus Co. as acting director of the engineering department center in Newark, New Jersey. He succeeds General Creasy, who was formerly director of the engineering development center. The announcement was made by J. F. Thornton, president of the firm of engineers and constructors.

Previous to joining the Lummus Co. in 1958, General Creasy had served as Chief Chemical Officer of the Army since 1954, in charge of the Army Chemical Corps, comprising some 12,000 military and civilian members. He also served as advisor to the Secretary of the Army, the Chief of Staff of the Army, as well as the Navy and Air Force and other defense agencies on matters within his field.

General Creasy received his B.S. degree from the U.S. Military Academy in 1926, and an M.S. degree in Chemical Engineering Practice from M.I.T. in 1936. He is the author of numerous management, technical, and military articles published in professional and technical journals.

Before joining Lummus, Dr. Souren Z. Avedikian of Princeton, N.J., was co-founder of Avedikian and Co. in 1932, Tidings Corporation of America in 1947, and S. Z. Avedikian & Associates in 1959.

Holder of about 30 U.S. and foreign patents, Dr. Avedikian has been engaged in the research and development of processes and products for over 25 years. Dr. Avedikian received all his degrees from Columbia University and is a member of Phi Beta Kappa, Phi Lambda Upsilon, and Sigma Xi.

Phosphates Seminar Conducted by Firm

NEW YORK—American Cyanamid Co. recently held a phosphates seminar at Lakeland, Fla., for its agricultural division sales representatives, it was stated by B. F. Bowman, division marketing director.

Mr. Bowman said the program involved technical discussions on the fertilizer industry and future trends in phosphate marketing.

Methods of processing phosphate rock, triple superphosphate, and phosphoric acid were presented to the group by John C. Bennett, manager of the phosphates and nitrogen department, with the aid of personnel from Cyanamid's phosphate operation in Florida.

Mining and production processes were observed by touring Cyanamid's holdings at Orange Park and Brewster.

The group also visited the new phosphates museum at Bartow, which is sponsored by the phosphate industry in Florida.

New Nitric Acid Plant Built in Record Time

LAWRENCE, KANSAS—A $1¼ million nitric acid plant with a rated capacity of 120 tons a day has just gone on stream here, only six months after the day the contract was awarded. The nitric acid produced will be used to make ammonium nitrate for the Midwestern farm region.

The record completion time, far below the usual ten to twelve months needed for a task of this complexity and size, was achieved by the Chemical Construction Corp., New York, which engineered and constructed the plant for the Cooperative Farm Chemicals Assn. in Lawrence.

Engineering began June 29, 1959, immediately following the contractual agreement, and was completed by mid-October, a total of only three and a half months. Construction commenced on Aug. 13 and the entire plant was completed and in successful test operation by Jan. 4. Two weeks later, on Jan. 18, 1960, it was formally accepted by the client.

Named Manager

GEORGETOWN, IDAHO—W. T. Tillotson, Chicago, has been named general manager of the Idaho Phosphate Works of Central Farmers Fertilizer Co., Montpelier, Idaho. He succeeds J. P. Cairns, administrative vice president who has been serving as manager of the works following the resignation of A. L. Stutts. The new general manager of works has served as a plant engineer, chief engineer and vice president in charge of manufacturing with U.S. Gypsum Co. and American Rockwool Corp.

VELSICOL

THE GROWING IMPORTANCE OF ENDRIN IN PLANT PEST CONTROL

ENDRIN ANSWERS MANY NEEDS—Velsicol Endrin fills the need for an insecticide of relatively low toxicity to humans that will kill a wide variety of plant pests that are either resistant to other insecticides, or difficult to control. It is a chlorinated hydrocarbon, with lasting residual qualities. Although it has greater insecticidal activity than other chlorinated hydrocarbons, it can be used safely by individual farmers. It is also economical.

USE INCREASING—Endrin now has over forty label acceptances (see list below) covering control of many more than that number of insects. Some of these acceptances represent substantial tonnage of potential use. Among these volume uses are the control of insects infesting cotton, tobacco, apples, sugar beets, sugar cane, and cabbage and other cole crops.

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RED BANDED LEAF ROLLER CONTROL ON APPLES—Endrin now has label acceptance for control of red banded leaf rollers on appies. In grower trials, it has been proven effective against even resistant leaf rollers. The same dosage will also kill plum curculios, which results in a considerable economy for the apple grower.

VELSICOL PROMOTIONS—During 1960, Velsicol Endrin will be promoted in various areas for major uses. These promotions will include advertising to farmers and dealer sales support. Details will be released as available.

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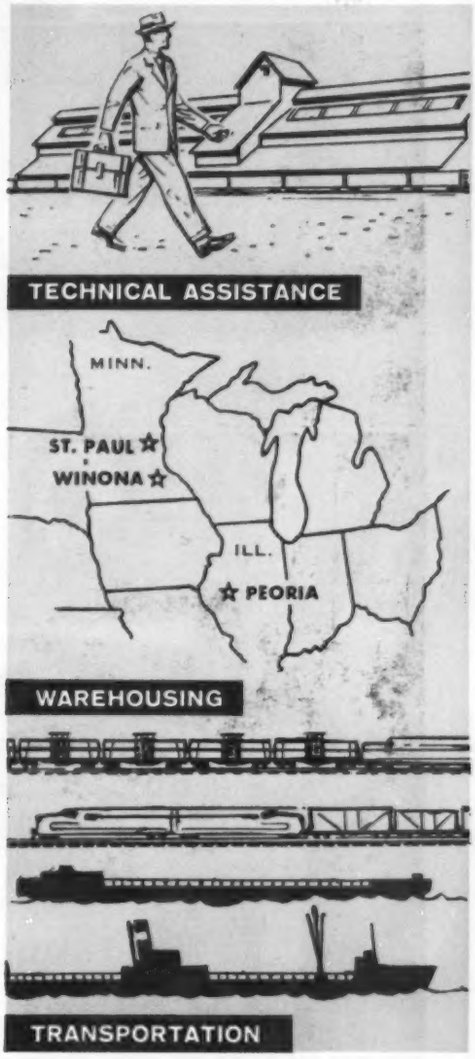

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STEPPED-UP PACKAGING — Here are some latest devices installed at the Walker-Gordon company fertilizer operations in New Jersey. A reversible conveyor that can be inclined to meet the worker wherever his location is on the stock pile has enabled Walker-Gordon to dispense with former "bag brigade" method which needed several men to do the work now done by one. At far right, scale with bag clamp fills packages, then conveyor moves them to tape sewing head. The installation of this machine is said to have saved 9,000 man-hours a year over the former hand-filling operation.

PACKAGING PROBLEMS REDUCED—(Three photos above) Flexible conveyors enable bags to be transported to front of trailer truck at outset of stacking job, and as job progresses, conveyor can be adjusted accordingly. In center shot, pressure roller mounted over motorized belt conveyor flattens just-filled bags with 200 lb. pressure before they are stacked in warehouse. This innovation was developed by the Walker-Gordon staff. Lower photo: Chester Steen, left, production manager, and Henry Jeffers, Jr., Walker-Gordon president, discuss material handling problems with Allan M. Baylis, Union Bag-Camp Paper Corp. packaging engineer.

Solving Problems of Material Handling Helps Manufacturer

PACKAGING AND handling of some 30 tons daily of fertilizer dehydrated from some 150 tons of raw manure from its 1650 dairy animals has been a problem for the Walker-Gordon Laboratory Co., primarily a certified dairy firm located in New Jersey midway between New York and Philadelphia.

The manure dehydrating enterprise, begun 21 years ago, has now become a $450,000 business annually, employing a staff of 18 men the year around to handle this portion of the dairy's by-product.

Sold under the trade name of "Bovung," the plant food is bagged the year around, but fully 70% of its sales take place during March, April and May.

Of the more than 7,000 tons of the packaged fertilizer stock piled at the Plainsboro, N.J. farm throughout the year, nearly 5,000 tons are shipped over a 90-day period.

"Until recently those three hectic months meant day after day of feverish activity and sometimes utter chaos," says Henry Jeffers, Jr., president of Walker-Gordon. "The seasonal rush almost always developed problems that accumulated from one day to the next."

An example was the daily traffic jam. According to Mr. Jeffers, a typical day would have as many as eight semi-trailer trucks waiting their turn in the warehouse area, with drivers sweating out the line for as long as four hours.

"It was common for us to end the day with a truck or two left over," the dairy executive says. "This meant the driver had to stay overnight, and of course that would give the next day's traffic jam a head start on us."

Chief bottleneck of the three month shipping operation was Walker-Gordon's inability to handle the loading of more than one truck at a time. Mr. Jeffers points out that, including about 20 minutes for the positioning of vehicles inside the warehouses, it took eight men over an hour to load a typical 18 ton trailer.

"Hiring new men to form a second loading crew would have run us about $12,000 a year, for people we wouldn't actually need on a twelve month basis," he continued. "It began to appear as though we just couldn't afford to stop that traffic jam." Mr. Jeffers said he then recalled that in 1952 Union Bag-Camp Paper Corp. had sent a packaging engineer to survey the farm's Bovung operation. The engineer's report suggested switching from manual to machine filling, and from manual wire tied closures to machine-sewn tape closures.

The changeover that year cost Walker-Gordon $2,000 for the complete installation, but eliminated 9,000 man hours a year, Mr. Jeffers said. He added that the investment paid for itself in 20 months. The switch to tape closures also saved three inches of storage space per bag over the former system, making it possible to stack the bags flat in warehouses and in trucks, instead of upright.

Mr. Jeffers later asked Union Bag's help in solving this daily traffic jam. Their recommendations would help him decide whether the company should adopt a palletizing system to speed up the handling of the filled bags or if an improved conveyor system should be installed.

A package engineering specialist visited the plant and made an on-the-spot survey of the storage and handling problems, noting how the bags were stockpiled in six warehouses. Again, as before, the answer lay in mechanization.

The engineer's report recommended portable, reversible belt conveyors both for piling bags into storage as well as taking them from storage and loading into waiting trucks.

Chester Steen, vice president and production manager of Walker-Gordon, reports that conveyors aren't new to the company. "We've used one-way power belts for loading trucks for years, but it always took a chain of two, three and sometimes four men to bring those bags down to ground level, especially where we've stacked them right up under the 20 foot warehouse ceilings," Mr. Steen said.

He adds that where four men were required to bring bags down from the top of a pile to where the old style conveyor began, the new reversible power belt can be inclined to meet the top man at his position under the ceiling, making the three other members of the loading team unnecessary. "As few as three men can load an 18 ton truck today in about 45 minutes," he says.

In the season ahead Mr. Steen says he plans to use seven men as two truck loading teams capable of handling up to 200 tons a day of the packaged fertilizer. The $2,000 investment in conveyors is expected to save Walker-Gordon about $12,000 in labor alone . . . and get rid of that traffic jam in the bargain.

Monsanto to Construct New Plant to Make Phosphoric Acid Concentrate for Industry

ST. LOUIS — Monsanto Chemical Co.'s Inorganic Chemicals Division will begin construction immediately of a plant to manufacture 105% phosphoric acid, E. J. Bock, assistant division general manager, has announced.

Erection of the plant at Addyston, Ohio (in the Cincinnati metropolitan area), will make Monsanto the nation's first commercial producer and shipper of bulk quantities of this concentrated acid, Mr. Bock said.

The product, which is 40% more concentrated than normal 75% acid, offers a number of advantages to various industrial and chemical processing industries, according to A. Q. Svoboda, product sales manager for the division. The acid, transported in tank car and tank truck quantities, is handled at normal usage temperatures; in addition, the high concentration results in both shipping and handling economies, Mr. Svoboda explained.

Called "Phospholeum" by Monsanto, the acid is a natural desiccant. It is also a sequestrant for many common trace minerals (such as calcium, aluminum and magnesium) which frequently interfere with chemical processing. Among other applications of the concentrate, it is used in the manufacture of liquid fertilizers. Its concentrated makeup is a factor in economical shipping, a Monsanto spokesman pointed out.

Absence of water in the product may enable its use in areas where acids containing appreciable quantities of water are unsatisfactory, Monsanto predicts.

Major markets for the new product in addition to liquid fertilizers are seen in surface metal treatment and as a dehydrating agent in the petroleum and other industries.

Although the concentrated acid can be readily diluted to regular acid strength, Monsanto also will manufacture both 75% and 85% acid at the new plant, which is scheduled to go on stream in early September, Mr. Svoboda said. Meanwhile, representative laboratory samples are available to industry.

MACA ELECTS OFFICERS

OMAHA, NEB. — The Mid-West Agricultural Chemical Assn. recently held its first election in Omaha. Robert Yapp of California Spray-Chemical Co. was elected president. Other officers are: Herbert Woodbury, Woodbury Chemical Co., vice president, and G. E. Zackert, Imperial Chemical Co., secretary-treasurer. Board of directors chosen include the above officers and Harold Howard of Thompson-Hayward Chemical Co. and Porter L. Williams of Stauffer Chemical Co.

MACA was organized in 1959 to work with Midwest college experiment stations and the extension service of the USDA. The association has a planned program of education and promotion for the improved use of herbicides, pesticides and other agricultural chemicals. Cooperation with the National Agricultural Chemical Assn. is planned.

NAMED SECTION MANAGER

MILWAUKEE — H. D. Vanderlip has been named manager, chemical processing and food machinery section of the newly reorganized processing machinery department of Allis-Chalmers Manufacturing Co.

Potash Company of America Names Vice President

CARLSBAD, N.M.—The executive committee of the Potash Company of America has announced that Houston N. Clark has been named vice president in charge of production.

Mr. Clark replaces Russell G. Haworth, who resigned. Mr. Clark was assistant to the president since November, 1958. A native of New Mexico, he joined the company in 1939. In 1941 he graduated from Rice Institute with a degree in chemical engineering.

His prior positions have included derivative plant supervisor, assistant refinery superintendent, administrative assistant and general superintendent.

BIG PYRETHRUM CROP

KENYA, SOUTH AFRICA — Estimates for the 1960 pyrethrum crop are that it will be one-third larger than the previous year, according to the Pyrethrum Board of Kenya. Pyrethrum insecticide exports to the U.S. for the 12-month period ending June, 1960, are expected to amount to more than $5 million, the board said.

New Testing Arrangement

NEW YORK—Catalin Corporation of America has announced signing with The Dow Chemical Co. of a cooperative agreement covering the synthesis and testing of new chemicals.

The major objective of the agreement is the creative testing and commercial development of compounds through a joint effort of the two companies.

Under terms of the agreement, Catalin will supply chemicals that it develops for testing by Dow, which in turn will provide Catalin with full reports of the program.

New Fertilizer Plant

MERIDIAN, MISS.—The Dixie Fertilizer Co., a newly formed organization, has announced construction of a new plant in Meridian will be started within 60 to 90 days. While construction figures were not released it is estimated the plant will cost about $300,000.

The plant will be located on grounds adjacent to the new sewerage treatment plant and will use waste material from the municipally operated plant, paying the city for the raw material.

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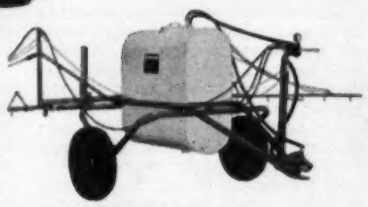

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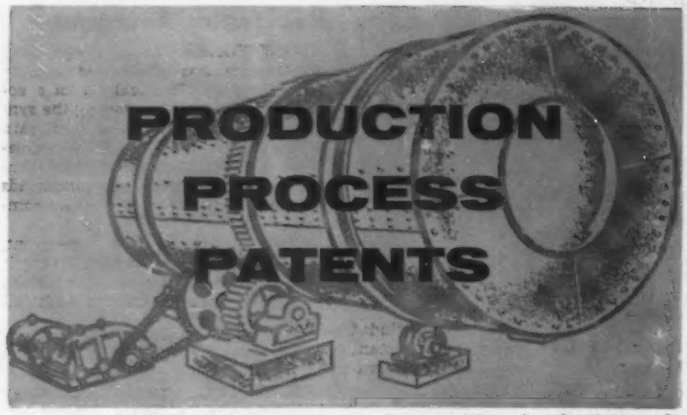
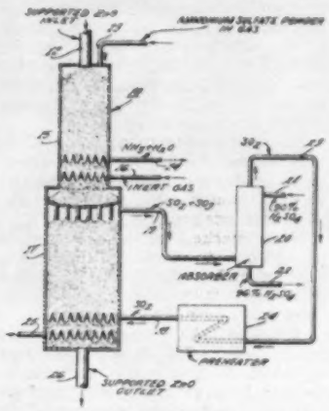


2,926,070

Decomposition of Ammonium Sulfate. Patent issued Feb. 23, 1960, to Thomas H. Milliken, Jr., Moylan, Pa., assignor to Houdry Process Corp., Wilmington, Del. In the method of preparing ammonia and sulfuric acid by decomposition of at least one salt from the group consisting of ammonium sulfate and acid ammonium sulfate by contacting said salt with a contact material comprising zinc oxide at 500-1000° F. to generate ammonia gas and to form zinc sulfate in the contact material, heating the thus formed contact material to thermally decompose the zinc sulfate to generate oxides of sulfur, and recycling the resulting zinc oxide containing contact material to contact additional amounts of said salt, the improvement which comprises: employing sulfur dioxide gas as a heat-transfer gas; heating said sulfur dioxide gas to a temperature above about 1350°; passing said preheated sulfur dioxide into the contact material comprising zinc sulfate to heat said contact material from a temperature below 1000° F. to a temperature above 1250° F. to decompose zinc sulfate into zinc oxide and sulfur trioxide, the formation of sulfur dioxide by thermal decompositions being effectively repressed by the presence of the atmosphere of sulfur dioxide heat transfer gas; withdrawing the effluent gases from the zinc sulfate decomposition zone; extracting sulfur trioxide from said effluent gases by absorption in an aqueous solution of sulfuric acid; withdrawing as a product of the process the thus concentrated sulfuric acid; and recycling sulfur dioxide gas as a heat transfer gas to the heating step.



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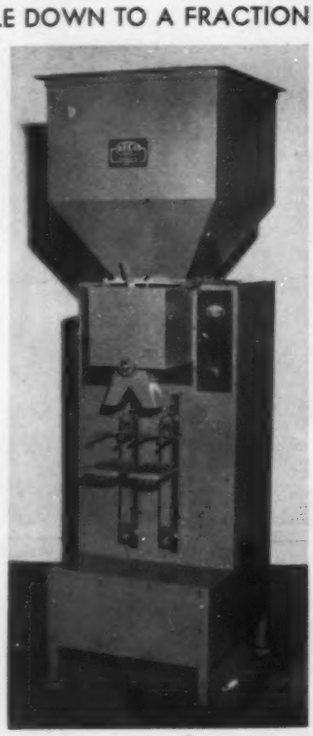
THE ANSWER TO RAPID PACKAGING OF ANY DRY POWDERED MATERIALS SUCH AS INSECTICIDES. FILLS BAGS OR CARTONS FROM ONE TO TEN POUNDS. NO STOPPING AND STARTING. MATERIAL FLOW IS CONTINUOUS. AS WEIGHT IS REACHED FLOW IS DIVERTED TO EMPTY CONTAINER. TWO EXACTLY ACCURATE BALANCE SCALES ARE ADJUSTABLE DOWN TO A FRACTION OF AN OUNCE. SPEED OF FILLING IS ADJUSTABLE AND IS LIMITED ONLY BY DEXTERITY OF OPERATOR IN PLACING EMPTY CONTAINERS AND REMOVING FULL ONES.



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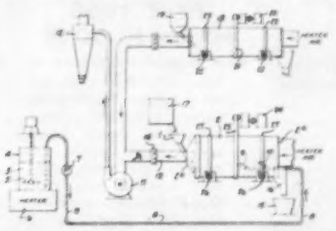
2,926,079

Process for Production of Fertilizer Pellets. Patent issued Feb. 23, 1960, to Benjamin G. Smith, Norfolk, Va., assignor to the Chemical and Industrial Corp., Cincinnati, Ohio. A continuous process for the formation of rounded and substantially smooth fertilizer pellets of substantially uniform size and at least 0.03 inch-1.5 inch in diameter by coating large nuclei in substantially individualized condition with a slurry containing a substantial amount of fertilizer solids and wherein agglomeration between coated, uncoated nuclei and fertilizer solids present in said slurry is substantially prevented, the steps comprising essentially treating a bed of nuclei of a fertilizer substance having a particle size of at least about 40 mesh and a moisture content below the agglomeration point in a chamber with constant agitation to produce a physical separation of a substantial portion of said nuclei from each other, passing said separated nuclei through a hot gaseous atmosphere containing an aqueous slurry of fertilizer substances in the form of fine droplets wherein the separated nuclei are contacted and coated with said fine droplets of fertilizer slurry, the moisture content at the surfaces of said coated nuclei being raised above the agglomeration point and then simultaneously and rapidly drying said coated and substantially separated nuclei to a moisture content below the agglomeration point, by passing hot drying gases, having a temperature sufficient so as to control the moisture content of the granulating bed and avoid deterioration of the fertilizer solids in said slurry, through said chamber and before said separated and coated nuclei start agglomerating, the coated nuclei being showered through said hot drying gases, and then recovering a substantially rounded and uniform product of said above desired size.



2,924,509

Process for the Manufacture of Aluminum Phosphate. Patent issued Feb. 9, 1960, to Hans Huber, Wiesbaden-Biebrich, Helmuth Keller, Ostrich-Winkel, and Hans Adolf Rohlfs and Wolfgang Dewald, Wiesbaden, Germany, assignors to Chemische Werke Albert, Wiesbaden-Biebrich, Germany. A process for producing aluminum phosphate, comprising mixing (1) a calcium phosphate, and (2) an acid aqueous solution comprising (a) hydrous aluminum sulfate in a quantity sufficient to react with said calcium phosphate to convert it to aluminum phosphate and (b) at least one hydrous aluminum salt of another mineral acid selected from the group consisting of hydrochloric acid and nitric acid in a quantity which renders the aluminum phosphate formed from said calcium phosphate soluble in the aqueous reaction medium, stirring and heating the formed mixture at elevated temperatures until said calcium phosphate is reacted with said aluminum sulfate to form aluminum phosphate dissolved in the aqueous solution, separating insoluble by-product calcium sulfate from the aqueous solution, then adding to the resulting aqueous solution an additional quantity of calcium phosphate in an amount sufficient to react with said aluminum salt of said mineral acid, and stirring and heating the resulting mixture in the manner aforesaid until said additional quantity of calcium phosphate is converted to aluminum phosphate, and separating the resulting insoluble aluminum phosphate as a precipitate.

2,926,197

Production of Benzene Hexachloride. Patent issued Feb. 23, 1960, to Frederick E. Kung, Akron, Ohio, assignor to Columbia-Southern Chemical Co. A method of preparing a benzene hexachloride composition which comprises dissolving an isomeric benzene hexachloride mixture including the gamma and delta isomers in a pair of immiscible solvents for benzene hexachloride, said pair comprising glycol and carbon tetrachloride, forming two immiscible liquid phases containing dissolved benzene hexachloride, glycol predominating in one phase and carbon tetrachloride predominating in the other, the gamma isomer selectively distributing in the carbon tetrachloride phase, and separating the liquid phases.

2,926,198

Production of Benzene Hexachloride. Patent issued Feb. 23, 1960, to Frederick E. Kung and Henry C. Stevens, Akron, Ohio, assignors to Columbia-Southern Chemical Corp. A method of preparing a benzene hexachloride composition which comprises dissolving an isomeric benzene hexachloride mixture including the alpha, gamma and delta isomers in a pair of immiscible solvents for the benzene hexachloride, said pair comprising a liquid polyhydric alcohol and a liquid halogenated hydrocarbon, forming two liquid phases containing dissolved benzene hexachloride, the halogenated hydrocarbon predominating in one of said phases and the alcohol predominating in the other, adjusting the relative volumes of the liquid polyhydric alcohol and liquid halogenated hydrocarbon, selectively distributing the gamma and alpha isomers in the halogenated hydrocarbon phase and the delta isomer in the polyhydric alcohol phase, separating the two phases, dissolving the ben-

Turn to PATENTS page 28

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 3

Are You Taking Full Advantage of Nitrogen Division Service?

During your rush season and in any season, Nitrogen Division, Allied Chemical, is better equipped than any other nitrogen producer *to serve you.* Here are three important reasons why—

1 Technical Assistance

To provide its customers with competent, well-qualified technical assistance, Nitrogen Division maintains the largest, best-trained, most-experienced staff of fertilizer technologists in the industry. This staff includes hundreds of fertilizer technicians, scientists and engineers working with millions of dollars worth of laboratory and pilot plant equipment.

These men are ready, willing and able to help you find the practical answer to your formulation, ammoniation and manufacturing problems. The accumulated skill of many years of experience augments your own efforts. And this service is available to customers without charge.

Nitrogen Division technical men work on your problem in your plant or in their laboratories using the most modern facilities. They are skilled in ferreting out trouble spots and in helping you to quickly correct operating techniques.

Remember, Nitrogen Division technologists originated and developed nitrogen solutions and the practice of ammoniating superphosphate. They have the *know-how* that counts when you need help fast!

2 Production Capacity

Long-time leading producer of fertilizer nitrogen, Nitrogen Division owns and operates three huge plants—at Hopewell, Virginia; South Point, Ohio; and Omaha, Nebraska—by far the biggest nitrogen production capacity in the country. And, Nitrogen Division offers the most complete line of nitrogen products available to the fertilizer manufacturer.

Look over the list of ARCADIAN® Nitrogen Solutions and other ARCADIAN Nitrogen Products on page 4 of this issue of ARCADIAN NEWS. No other nitrogen producer is so well prepared to supply your complete nitrogen needs. You can get the exact nitrogen products you want from Nitrogen Division—and *all* your nitrogen from one source.

3 Delivery Facilities

Getting your order to you on time for you to meet production schedules is standard procedure for Nitrogen Division. Its three plants are strategically located for fast shipment to fertilizer manufacturers, with the aid of the largest fleet of tank cars in the industry plus many tank trucks. A widespread network of "in-transit" storage points is maintained, where fully-loaded tank cars sit on railroad sidings ready to move immediately for fast deliveries.

All Nitrogen Division facilities are closely linked by teletype, direct private phone and other methods of rapid communication. Every provision is made to expedite your orders—to get your nitrogen rolling to you immediately.

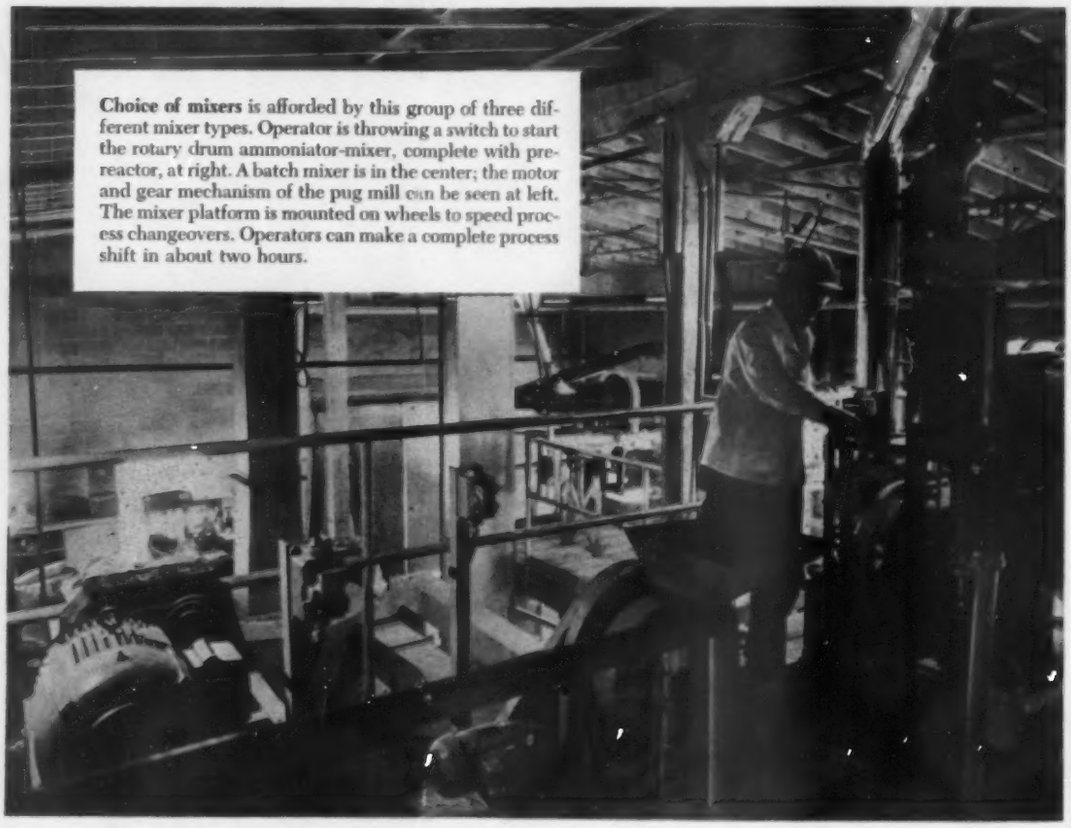
Nitrogen Division has the products and the people to serve you best! Why not see how well this service operates? Contact: Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y. Phone: Hanover 2-7300. Or call one of the 12 other offices listed on page 4 of this issue of ARCADIAN NEWS.

No Production Problem Too Tough For Modernized Fertilizer Pilot Plant

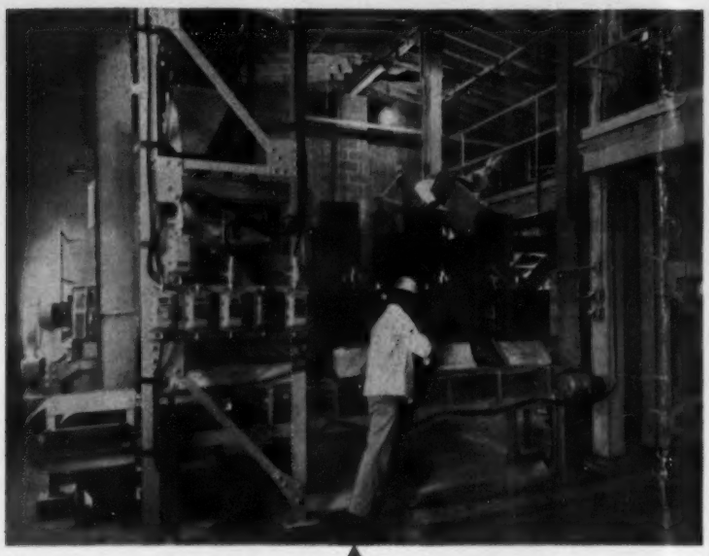
Nitrogen Division's technical service facility at Hopewell, Virginia, can cope with every type of process problem ...experiment with new techniques!

Mixed-goods producers now have a better-than-ever source of aid and guidance in Nitrogen Division's enlarged and modernized fertilizer pilot plant. In a compact but complete operation, the Hopewell pilot plant can produce any type of mixed fertilizer to order... simulate the working procedures of any manufacturer. All of the production equipment common to the industry is available, and can be used in any way to reproduce, correct or pioneer a product condition... or even create a completely new mixed fertilizer! The key to this versatile operation is a built-in mobility. An entire section of the equipment—the platform holding three different types of mixers—is on wheels to facilitate changing from one production technique to another.

This highly flexible pilot plant facility, coupled with the wealth of experience and high competence of Nitrogen Division chemical engineers, chemists and technicians makes the famous Nitrogen Division Technical Service more valuable than ever to fertilizer producers. For complete details—without obligation—write to Technical Service, Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y.

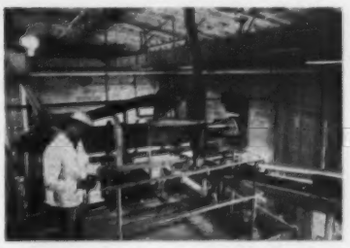


Choice of mixers is afforded by this group of three different mixer types. Operator is throwing a switch to start the rotary drum ammoniator-mixer, complete with pre-reactor, at right. A batch mixer is in the center; the motor and gear mechanism of the pug mill can be seen at left. The mixer platform is mounted on wheels to speed process changeovers. Operators can make a complete process shift in about two hours.



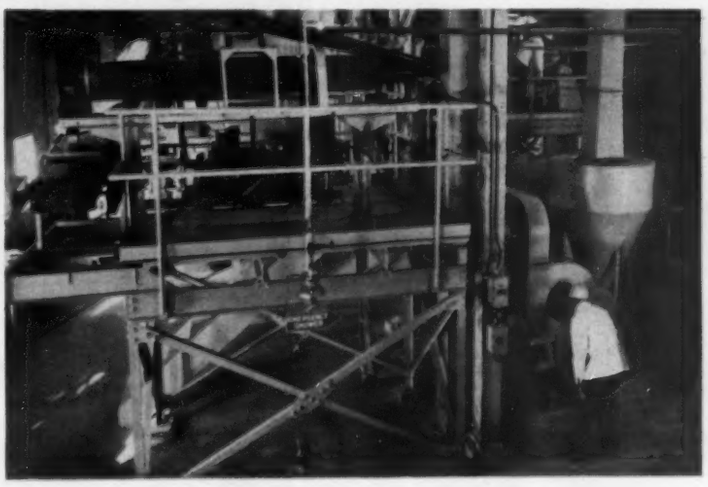
Continuous mixed fertilizer production begins here, at the solid feeder station. Man above is loading superphosphate into a measuring bin, as man below takes a weight sample for checking. Solid materials feed from measuring bins downward to a moving belt that goes off at right to the mixer. The sloping hopper, at top left, contains screens that separate fines, on-size and coarse granules. On-size goes to bagged or bulk storage; coarse proceeds to the crusher, and then recycles to the screens; fines go directly to the moving belt for recycling to the mixer.

Liquid feeder station gives convenient centralized control over the flow of various liquids—water, nitrogen solution, acid—to the pre-reactor and mixer.



Operator checks a sample for temperature before mix enters the cooler through duct at left. Mix travels through cooler to output end at right, losing about 50 degrees of heat before it drops to a moving belt climbing to the screens.

View of processing area shows mixer platform structure at left. Extra granulator for optional use is directly beneath rotary ammoniator-mixer. Note wheels and floor tracks that make the mixer structure easy to move for process changes.



Overall view shows compact design of pilot plant. Technician in foreground is peering into dryer. Funnel shaped equipment next to dryer is the dust collector. Above and behind this is the mixer platform, where a man is checking the pug mill. The long, cylindrical object just above center is the cooler, next stop for the mix after it leaves the dryer. The top of the solid feeder station can be seen in the area beneath the cooler.

HERE'S THE BIG LINE OF Arcadian NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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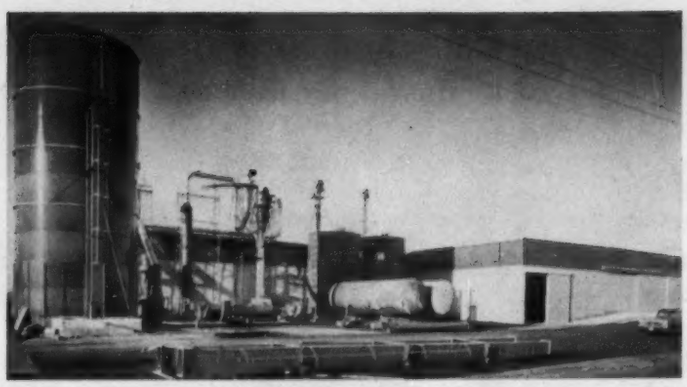

REPLACES BURNED FACILITIES — The Fersolin Corp. plant at Santa Rosa, Cal., was built to replace unit destroyed by fire a year ago. New plant cost $500,000 produces 25 tons a day.

California Plant, Rebuilt After Fire, Now Producing Unusual Product at 25 Tons Daily

SAN FRANCISCO — The Fersolin Corp. of San Francisco is resuming production of its new fertilizer "Loamite", having completed reconstruction of the plant at Felton, Cal.

The original plant was just beginning production a year ago when it was completely destroyed by fire. A new and larger plant was reconstructed at the location at a cost of around a half million dollars. The original plant, intended as a kind of enlarged pilot operation, had a capacity of only ten tons a day. Capacity of the new plant is 25 tons, according to Robert Hind, vice president and general manager.

"Loamite" is made from wastes at Douglas fir saw mills, and has been processed to contain "all the elements necessary for growth." Fersolin is reportedly the only company in the nation to turn wood working by-products into a complete, balanced fertilizer and soil conditioner. Presently the firm is using sawdust from lumber mills near its new Santa Rosa plant as its primary raw material, although other agricultural products can be processed for use.

A merchandising and point of sale program will be launched by the firm, as well as an advertising program. For the time being distribution will be confined to northern and central California.

Thomas A. Hall Joins Colloidal Products Corp.

SAUSALITO, CAL. — Colloidal Products Corp. of Sausalito, announces the appointment of Thomas A. Hall as Northwest manager. Mr. Hall, a native of the Pacific Northwest, was associated with one of the first helicopter operations west of the Mississippi after his release from the navy air corps in 1946. His subsequent activities have included wide experience in the agricultural crop dusting and spraying business, the operation of a fruit orchard and recently, technical sales work in the agricultural chemicals field.

Thomas A. Hall

Colloidal Products Corp. has been developing and manufacturing adjuvants for agricultural chemicals since 1920 and marketing them internationally through the major suppliers of agricultural chemicals.

Swift Builds Eighth Pesticide Formulating Plant

HARLINGEN, TEXAS — A pesticide formulating plant, Swift & Co.'s eighth in the nation, is under construction here and is expected to go into operation early in April.

R. J. Steeno will be in charge of sales and R. S. Gattchell will be superintendent of production. Both are from Swift's Hammond, Ind., plant.

Emulsified liquid pesticides, combinations and dusts including the phosphated types will be formulated.

Texas Gulf Sulphur Co. Stops Mexican Operations

NEW YORK—Texas Gulf Sulphur Co. announced the suspension of operations at its Mexican sulphur plant at Nopalapa, in the state of Vera Cruz.

The decision is a matter of economy, according to the company. The Nopalapa plant is a small producer and its cost of operation is high relative to the company's other more efficient producing units.

Since production began in 1957, Nopalapa's output has averaged about 100,000 tons of sulphur annually. This represents less than 4% of the company's total average annual sulphur production.

Texas Gulf Sulphur operates four major Frasch plants in the U.S., all in Texas, located at Boling, Moss Bluff, Spindletop and Fannett. It also operates sulphur recovery plants at Worland, Wyo., and Okotoks, Alberta, Canada.

To Head New Division

DECATUR, ILL.—Abe L. McCoskey has been named to head a new division recently established by Midstate Machinery Co. of Decatur.

This new division will specialize in the construction of poured concrete grain storage bins, elevator construction and maintenance, fertilizer plant construction and equipment installation and complete millwright service.

Mr. McCoskey is a veteran of 15 years experience in this field. Formerly construction superintendent for the J. E. Reeser Co. of Maroa, Ill., he has an extensive background in construction.

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ACCESSORIES—complete choice of strainers, connectors, spray guns, nozzles for broadcast spraying, valves and fittings.

DirectoValve with Nylon body for selective spray control of booms. Write for Bulletin 100.

Diaphragm Pressure Relief Valve—write for Bulletin 101.

SPRAYING SYSTEMS CO.

3214 Randolph Street

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Charles F. Burroughs Dies; Was F. S. Royster Chairman

NORFOLK, VA.—Charles F. Burroughs, 88, chairman of the board of F. S. Royster Guano Co., died Feb. 24 at Norfolk where he made his home. He had been associated with the Royster firm all of his business life which extended over a period of over 75 years.

When only 10, he was employed as an office boy by the late F. S. Royster who was then starting his company at Tarboro, N.C. Mr. Burroughs assumed major responsibilities early, being sent to Norfolk in 1891 (at age 20) to take charge of the then new venture which developed when the fledgling Royster firm expanded and established itself where port facilities were available.

Nine years after coming to Norfolk, Mr. Burroughs was made executive vice president of the firm. Upon the death of Mr. Royster in 1928 he became president and in 1935 was given the added responsibilities of treasurer. He became chairman of the Royster board in 1958.

His son, Charles Franklin Burroughs, Jr., is president of Royster at the present time.

Mr. Burroughs Sr. had been active in numerous civic, charitable and religious organizations during his long life in Norfolk, and had made a name for himself as a breeder of pure-bred Guernsey cattle.

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Now a new, low cost, stable, powerful lemon odor for masking pesticides, herbicides and fertilizers.

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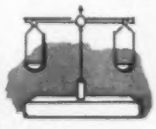

ACCURATE

If the formula is right — the MARION MIXER will mix it with complete accuracy.

THE MARION MIXER, now in use in many chemical plants throughout the country, is designed to produce the highest tonnage at the lowest possible cost. Also, its simple but efficient design makes it an ideal special formula mixer.

The MARION MIXER is the leader for mixing: Dry and semi-wet chemical powders—Agricultural chemicals — Fertilizers — Materials for chemical processing plants — Insecticides.

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"I'm sold on your Sul-Po-Mag Program . . ."

Mr. George Lippincott, president, Dorchester Fertilizer Co., Cambridge, Md.

". . . should really help sales!"

Alf Oines, president, Michiana Chemical Co. of Niles, Mich.

Many manufacturers count on this Sul-Po-Mag® program to boost fertilizer sales and profits

"SPM program has paid off for us where it really counts . . . in increased fertilizer sales"

Mr. T. F. Bridgers, president of the Farmers' Cotton Oil Company, Wilson, N. C.

". . . has helped us move fertilizer"

John C. Crissey, division manager Soil Building Service, GLF EXCHANGE, Ithaca, N. Y.

"Yields of tobacco UP . . . as much as 60 to 101 pounds an acre! Those are results of actual experiment station tests made with complete tobacco fertilizer containing Sul-Po-Mag" — with these words a radio announcer in the Southeast begins a 1-minute Sul-Po-Mag spot announcement. Thousands of growers in the area will hear his profit-making message. Through it they will seek out their local fertilizer manufacturers who subscribe to the SPM program. Radio . . . just one of the SPM *super-salesmen.*

IMC's extensive Sul-Po-Mag program is educational in scope. While selling the need for long-lasting magnesium from SPM in crops and soils, it is also selling YOUR fertilizer. This is a big program and another reason why IMC puts these top "salesmen" on your team . . . without cost to you, of course.

A full schedule of IMC agricultural magazine ads — national and regional — as well as state newspapers work hard for you . . . seven days a week. Various promotional materials are available for you to use in pinpointing magnesium fertilization problems of the major crops in your area. And they carry your company imprint.

See the adjoining page for details on International Minerals' SPM program. Then contact your IMC representative for the complete story.

The Sul-Po-Mag story is a lively topic of conversation wherever growers meet. One of the reasons is IMC's national and regional SPM advertising program. In 1959, Sul-Po-Mag advertising reached 2,567,000 farmers, growers and influence groups in magazines alone.

Consumer crop packages are for you to use on the local level. This potato crop package is one of eight complete crop packages that provide you with jumbo postcards, folders, newspapers, and magazine ad mats, news releases and radio announcements promoting Sul-Po-Mag use on individual crops.

Colorful and forceful SPM posters are available for you and your dealers. When imprinted with your company name and address, they tell growers you have Sul-Po-Mag ready to serve their crop needs. These display signs are full color and imprinted free of charge.

The Sulphate Bulletin features the latest news and research reports on SPM, along with useful information on sulphate of potash. Every 3 months more than 30,000 bulletins are sent to fertilizer manufacturers, county agents, vo-ag teachers, soil conservationists and growers.

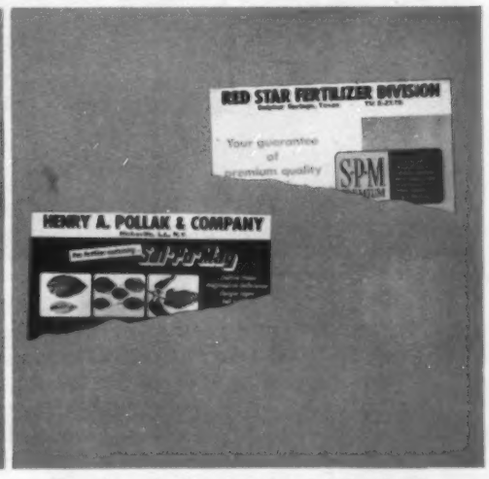
Sul-Po-Mag mailers and envelope stuffers are effective for *repeat sales.* You can send them out with monthly billings and keep telling the SPM story. Many manufacturers have earned extra sales with this quick-fact form of direct selling.

S·P·M
PREMIUM
Quality fertilizer containing a combination of readily available magnesium and sulphate of potash obtained from Sul-Po-Mag

This seal is available as production proofs for printing on the bag. It will enhance your bag design as well as tie you in with the total SPM program. Also the seal comes as bag tags or stickers. Three forms of the seal are provided to meet your state requirements.

IMC's Sul-Po-Mag radio programs cover magnesium needs through 1-minute spot commercials. Content is terse, with factual and helpful tips to growers. This highly important sales medium stimulates impulse buying during the fertilizer season.

The Magnesium booklet is a vital part of the Sul-Po-Mag program. It illustrates the importance of magnesium for high crop quality and top yields. IMC has answered thousands of questions on recognizing magnesium deficiencies in fruit, vegetables, field crops.



The imprinting service is the backbone of the SPM program. Your company name and address on a direct mailer or full-color wall chart has all the authority of a direct contact with a customer. Your name and location are important parts of your total advertising effort.

Products* for growth

IMC

*Trademark

AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

15-60

Beware of Smug Attitude . . .

Avoiding Hazard in Liquid Fertilizers

SAFETY STATISTICS in the fertilizer industry are not particularly good when compared to other industries involving equal or greater hazards. The average rate for the chemical process industries is around 3.55 injuries per million man hours of exposure; but the record for the fertilizer industry (in 1958) was 8.27. There is ample room for improvement.

Why should the fertilizer industry have such a record? Is it the presence of extreme hazard? No. The high explosives industry has a frequency of only 1.34 and fuses and explosives a rate of 1.92. These latter are extremely hazardous occupations and must of necessity take seriously the matter of safety. It is evident, therefore, that attitude and effort towards safety is of more importance than the mere nature of the operation.

Thus, the lack of a serious attitude toward safety in the industry appears to be one main reason for a high accident rate. Safety must be taken with dead seriousness to be effective. Let us take a closer look at the matter of safety and of attitude.

First, too many fertilizer plant personnel seem to be in too much haste to take time for safety. There is sometimes a mistaken association of "manliness" attached to neglecting safety precautions. Some men have actually developed a tolerance to strong ammonia vapors and belittle their fellow workers for not being able to tolerate the fumes.

Of all protective devices, those having to do with the eyes are of unusual importance. The finest pair of goggles, however, is practically worthless if neglected by a workman who considers himself too "brave" to wear them. His swagger may quickly disappear, however, if an emergency arises and he must find his way out of the vicinity of a discharging relief valve without being able to see or to breathe.

Handling Liquids

Handling liquids with safety involves numerous operations. These include procedures and physical facilities for unloading; proper pipes and valves; and the installation of safety showers close by.

One of the first considerations is a safe place to make connection with the car or truck. More is needed than a mere spot on the track and a pipe or hose reaching it. To have maximum safety, a tank car unloading platform should be built and there should be at least one safety shower for every two tank car locations.

There should be an established procedure for connecting and disconnecting tank cars, known to everyone. For example, if warning signs are always put up, the brakes are always set and the wheels are always blocked, there is little chance that a tractor operator will move a connected car. Moving a tank car and thus breaking connections, is not only a serious hazard to anyone in the area, it is also a very poor way to maintain public relations.

Next, consider how the liquid is taken out of the tank car. Most plants use air pressure on nitrogen solution and on acids. This has been considered acceptable if proper precautions are taken. But a direct connection between the air line and tank car is not a proper precaution. There are a number of minimum devices to be included for safety. They are:

1. **A water and oil separator.**
2. **Shut-off valve.**
3. **Pressure-reducing valve.**
4. **Pressure gauge.**
5. **Safety valve.**
6. **Tee with a valve on the side.**

The water and oil separator is needed more on acid tank cars than on nitrogen solution cars because water added to an already full acid car will give off heat and might develop excessive pressure.

Location of the shut-off valve should be on the unloading platform. The pressure-reducing valve should be set at 30 psi for all tank cars except medium and high-pressure nitrogen solution cars. The pressure gauge warns in case of failure of safety devices, and the safety valve should be set to pop when pressure gets to 1 to 2 lb. above pressure-reducing valves. The tee and valve are installed to bleed air pressure off a car before disconnecting.

A pressure of more than 30 psi is needed in some plants to unload tank cars containing nitrogen solutions. When this is the case, two sets of air line fittings should be used. If only one is used, the safety pop off valve would have to be adjustable. This in itself contains an element of hazard, since it might be set incorrectly.

When unloading low pressure tank cars, gagging tank car relief valves is not a good practice, particularly when air line fittings are not employed. A liquid pump would be more satisfactory to use if the nitrogen solution must be moved under high pressure.

Several cautions are in order when piping liquid from tank car to storage or processing. No. 1 is to use a pipe strong enough for the job. In the case of anhydrous ammonia, this means schedule 80 pipe. For solutions and acids, schedule 40 will do unless the pipe being used is of steel. In that case, schedule 80 should be designated to allow for possible corrosion.

Beware of Welding Pipes

Welding, cutting, heating or using liquid pipe lines for a welding ground is dangerous. Residual ammonia in a pipe line could have enough air to burn, when heated. Almost always,

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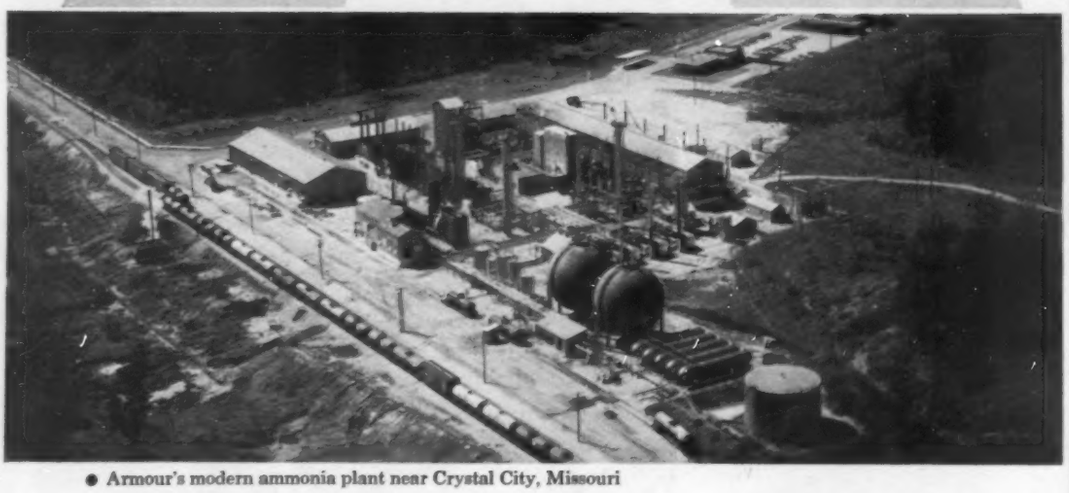

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the Handling of In and Out of Plant*

there will be some ammonium nitrate in the nitrogen solution pipe lines, especially in the corrosion scale and in the threaded joints. This nitrate will burn and give off enough gas to cause pressure explosion.

The pressure thus developed may rupture the pipe near the point of heat and at joints, resulting in injury to welder. If putting heat on the pipe is unavoidable, the pipe must be thoroughly flushed with water and opened up to prevent pressure build-up. The welder must have protection, especially for the eyes, face and hands against possible flying solid particles of scale.

Whenever an air line or water line connects with a nitrogen solution or acid line, the air or water line must have a check valve. Even air into water needs a check valve to prevent water getting back into the air line. Water coming out of the air line into the acid line could develop a steam pressure and endanger workmen, especially those around the ammoniator. Acid or nitrogen solution in the air line could cause some serious burns when the personnel proceeds to blow dust off of themselves. (Building codes in various areas should be checked for specific restrictions and instructions concerning the cross connections of chemical lines with the main water supply.)

Any time that liquid can be isolated between two valves is the time to stop and consider if a safety hazard is being created. In the case of anhydrous ammonia, the coefficient of expansion is large enough and the hazard in case of a ruptured line is great enough that a relief valve must be installed between shut off valves. Also, the relief valve must be vented to a safe place. If there is a heater on an acid or nitrogen solution line, there definitely should be a relief valve if this section can be closed off.

If aluminum lines are used for nitrogen solution, they should be protected on the outside from phosphate dust. Phosphates will react rapidly with aluminum and develop pits in the pipe line. If plastic pipe lines are used, they should be protected from excessive vibration or shock, which can break them.

Storage Hazards

Storage facilities, like pipe, must be picked for the job and inspected regularly. In the case of a storage tank, the liquid should be moved to process by a liquid pump. The chances for a pressure explosion on a corroded steel tank are too great to warrant use of compressed air.

Pressure relief valves and also vacuum breakers must be on storage tanks. In the case of acids stored in steel tanks, hydrogen gas is released as corrosion takes place. A pressure could be built up that could rupture the tank. The possible presence of hydrogen should never be forgotten—it is extremely explosive when mixed with air. When a nitrogen solution tank is being filled, it will generally need venting. The vent should be piped to a safe place. It can be vented under water and then be flushed away or hauled away.

If a vacuum breaker is not installed on an acid or nitrogen solution storage tank, a collapsed tank could result.

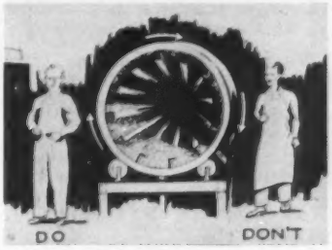
Extra precautions must be taken in inspecting or repairing storage tanks. They must be thoroughly flushed out to get rid of any ammonia vapor or hydrogen gas. The flushing must proceed long enough to dissolve all of the acid or ammonium nitrate in the corrosion scale. If there is any residual acid, hydrogen could be formed while the tank is being repaired and could result in a terrific explosion. If welding or cutting is required in the tank, it should be steamed out first. Properly done, steam cleaning will insure that there are no pockets of hydrogen remaining in the tank. Tank cleaning and repairs should never be undertaken by one man alone.

Ammoniation Care

Now, we have the liquid raw materials up to the point of use. The ammoniator operator is the man most concerned with the safe end use of the liquid raw materials. Dangers involved in improperly using both acid and nitrogen solutions in an ammoniator are well known. Excessive use of acid and poor distribution of acid and solution inside the ammoniator can result in flash fires. Such improper operation will also result in loss of nitrogen and air pollution problems.

The ammoniator discharge end must be open and well lighted, so that the operator can see the bed action in the ammoniator section, without having to place his head inside. If he cannot see what is taking place inside the ammoniator, the bed could become wet and stagnant resulting in a hazard of fire and also allowing the possibility of acid forming a blow hole and splattering the operator.

One very effective way to protect the operator from being splattered by an acid blow is to keep him out of the line of splatter. For example, if an ammoniator turns



*From paper presented by Larry L. Lortscher, Spencer Chemical Co., at 1959 Fertiliser Safety School.

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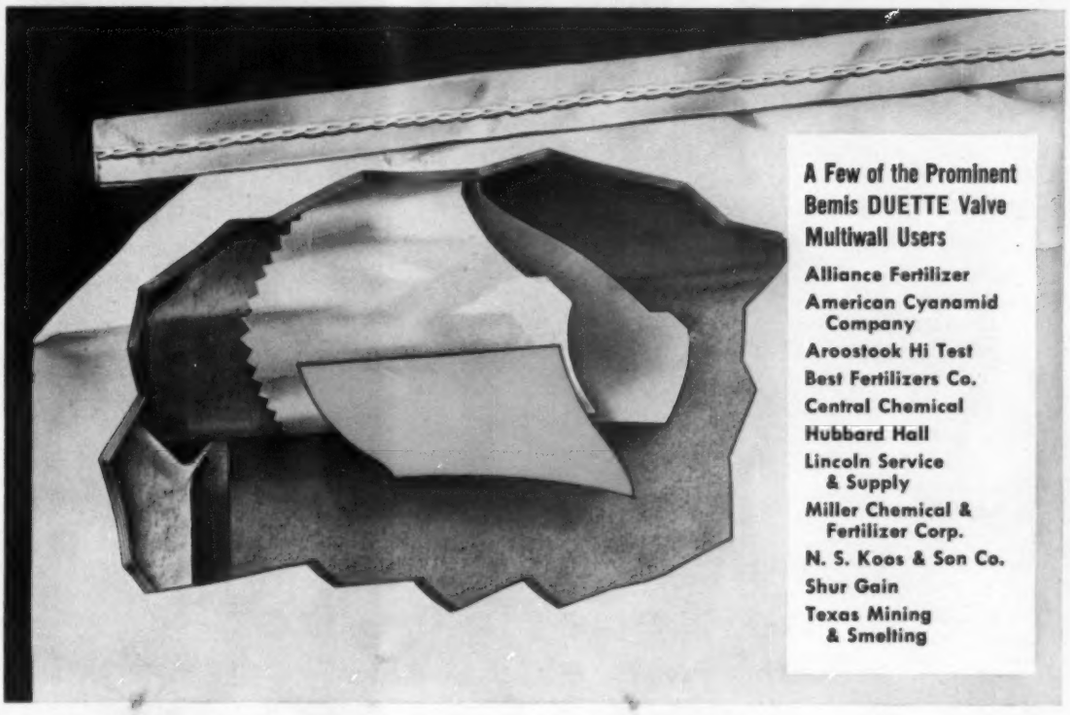

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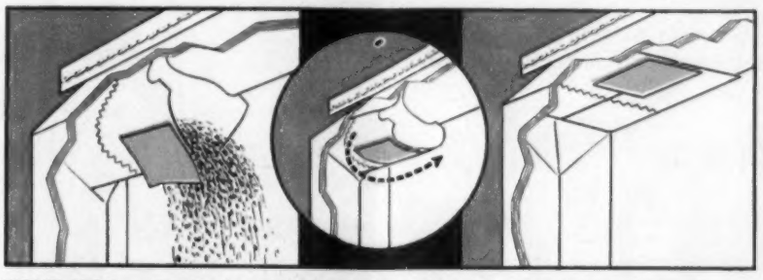

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counter clockwise (looking at the discharge end) the fertilizer bed will be on the right side and an acid blow will shoot over towards the left side. Now, if the operator's station is laid out so that it is more convenient to stand at the right side to observe, he is not likely to be hit by any acid spray. The operator still wants to be able to observe from the left side, but he should not get as close.

The operator's station should be designed so that he can get away in most any direction. He should also have easy escape to the outside or a room or stairwell that is supplied with fresh air. Two safety showers, in different locations, for the ammoniator operator's use, will increase his chance of being able to wash himself off quickly.

Emergency equipment to protect the worker from any hazard arising from using acid, nitrogen solutions and anhydrous ammonia, must be near the point of need, in good repair and clean. An ammonia face mask in the office is next to worthless in an emergency in the plant. Every man should have chemical goggles and every man should be obliged to wear them when connecting tank cars or working on pipe lines. In the case of acid, a felt hat and rubber gloves are good insurance.

Every plant should have a self-contained breathing apparatus for emergency use. For example, should a pipe line burst and a man be knocked unconscious, complete protection would be needed for the rescuer. Self contained breathing apparatus or an air line mask is recommended for internal tank inspection. For inside tank work, a rescue harness is also recommended. Then, if something should happen to render the man unconscious he can be withdrawn quickly.

Specific Materials

Next, let us consider the safety aspects of specific liquid raw materials. Anhydrous ammonia is stored as a liquefied gas, which, at normal temperatures results in pressures as high as 300 lb. per square inch. This, of course, means that equipment must be designed for pressure. Relief valves are required on tanks and should open at 250 lb. per square inch. Since a relief valve should never have a shut off valve between it and a tank, a dual relief valve system is desirable so that they can be inspected and repaired without emptying the tank. Whenever sight glasses are used excess flow check valves should be installed to prevent complete emptying of the tank in case a sight glass were broken.

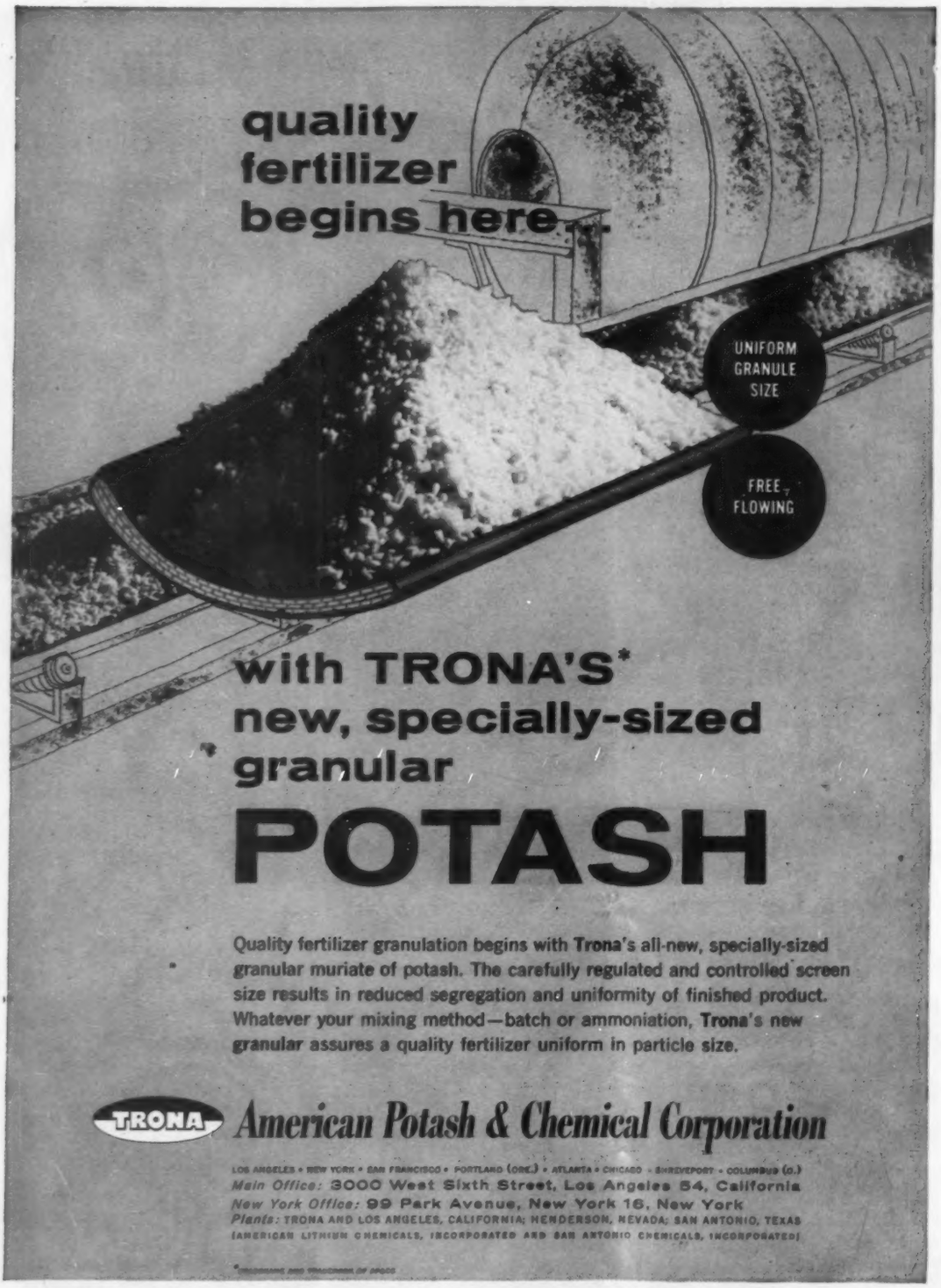
Ammonia is extremely volatile and noxious. Being detectable in small quantities, a man can generally escape before he gets a lethal dose. A man can smell 50 to 100 parts per million of ammonia in air, and from 5,000 to 10,000 parts per million (½ to 1%) are required to be instantaneously fatal. This is about one to two pints of liquid anhydrous ammonia when allowed to evaporate in a closed room 30 ft. long by 10 ft. wide by 10 ft. high.

The best remedies are from fast washing for external contact and oxygen in case of excessive amount in lungs. Oxygen should be administered only by trained personnel. It is fortunate that ammonia vapor is light, which makes natural ventilation very effective in carrying off the fumes.

Liquid ammonia has a high coefficient of expansion. This, coupled with its volatility, makes it necessary to use a relief valve at any point where liquid ammonia can be trapped. Sight glasses should never be closed while filled with liquid ammonia. The filling depth of a storage tank should be carefully watched.

A horizontal tank should never be filled to a height of more than 90% of its diameter. If the ammonia is cold when put in storage, a lower limit is necessary; for example, at zero degree Fahrenheit the liquid level should not come to more than about 75% of the tank's diameter.

Ammonia vapor, mixed with air, constitutes a fire hazard if the amount of ammonia is between 16 and 25%. This is not really considered flammable as it would be unlikely to occur in open air. ICC does not lable it flammable. But, it is possible for the flammable range to exist in closed equipment. For this reason tanks should be well grounded. Explosion-proof electrical equipment is recommended for the storage area. Anhydrous ammonia is not corrosive to carbon steel, which is generally used for piping and storage. Copper, zinc and silver are corroded by ammonia. Consequently, the common brass valve, galvanized pipe and tin or silver solder should never be used near ammonia. Unprotected mercury bulb thermometers should never be used with anhydrous ammonia because mercury and ammonia form truly explosive compounds.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Richardson Scale Names District Manager

CLIFTON, N.J.—The appointment of Richard Gruber as its New England district manager, effective Jan. 1, 1960, has been announced here by Richardson Scale Co., manufacturer of automatic weighing and proportioning equipment and controls.

Richard Gruber

Prior to his new appointment, Mr. Gruber was a sales engineer headquartered in the Cleveland area.

Address of the New England district office is P.O. Box 355 (14 Bunker Hill Parkway), West Boylston, Mass. (Telepone: Temple 5-4084).

More Fertilizer Used

UNIVERSITY PARK, N.M.—Total shipments of commercial fertilizer into New Mexico during the last quarter of 1959 were nearly 12% above shipments for the corresponding period of 1958, according to Russell W. Ludwick, chief of the division of non-food inspection for the New Mexico State Department of Agriculture.

Tonnagewise, the last quarter of shipments amounted to 2,687 tons compared to 2,347 tons for the October-December period of 1958.

Peruvian Plant Opens

CALLAO, PERU—The first chemical fertilizer producing plant in Peru has begun operations here.

A new $7 million plant, built by Fertilizantes Sinteticos, has a 50,000 ton annual capacity of nitrogenous fertilizers, phosphates and other plant foods.

Scientific Find Enables Nitrogen-Fixing Chemicals to Work Outside Bacterial Cell

WILMINGTON, DEL. — A scientific breakthrough described as "opening the door to understanding a major life process" has been achieved in the Du Pont Co.'s fundamental research work, the company has announced.

For the first time researchers have duplicated in a test tube the reaction nature uses within a living cell to create the nitrogen compounds without which no life can exist.

They have discovered a technique, long sought by scientists around the world, by which nitrogen-fixing chemicals can be separated from bacteria and stimulated to perform their function outside the bacterial cell. Lacking such a technique, scientists have been frustrated in their research on this vital natural process.

Nitrogen as a gas is available in huge quantities in the atmosphere, but it can be used in this elementary form only by certain low forms of life. The nitrogen gas of the atmosphere is so unreactive that extremely high temperatures and pressures must be used to convert it to chemical compounds useable by plants. It has long been known that some bacteria are capable of fixing the elementary nitrogen of the atmosphere at ordinary temperatures but how these bacteria do it has remained a nagging mystery.

"Full understanding of this biological process is expected to answer many significant questions about the chemistry used by nature. It could also lead to greater farming efficiency," Du Pont spokesmen commented.

Research on the mechanism of nitrogen fixation in microorganisms has been carried out for several years at the Du Pont Experimental Station here by Drs. James E. Carnahan, Leonard E. Mortenson, Howard F. Mower, and John E. Castle, all of whom are in the central research department. The subject is being studied as one phase of Du Pont's efforts to learn more about the chemistry and physics of biological processes.

This work is part of the company's program of fundamental research—the search for basic scientific knowledge without specific commercial objective. Inaugurated in 1927, the program now engages approximately 400 scientists and costs about $14 500,000 a year.

The earth's supply of fixed nitrogen must be constantly renewed since it eventually returns to the atmosphere. Some comes from mineral nitrate deposits, some is manufactured, some is created in the atmosphere by lightning. However, these sources are secondary and inadequate. For instance, industry produces about 10 million tons of fixed nitrogen annually for fertilizer, but that vast quantity is only about 2% of the nitrogen needed by the world's fertilized crops.

Most fixed nitrogen used by plants and the animals feeding on them is produced by certain bacteria and algae, either independently or in association with legumes. These microscopic one-celled organisms in the soil or water carry out chemical reactions which can be matched only in complex industrial equipment, using extremes of heat and pressure.

Since the middle of the nineteenth century scientists have been studying methods of fixing nitrogen, seeking better understanding of the mechanisms involved. They have generally agreed that it is performed by enzymes, but study of these has been blocked because they could not be extracted from living cells without being destroyed.

The researchers overcame this barrier by first breaking open the living cells of selected bacteria and extracting the enzymes under controlled conditions to avoid damage to the enzyme system. Second, pyruvic acid is used to provide the necessary energy for the nitrogen-fixing reaction. Extracted enzymes then consistently carry out the process outside the cell bodies.

The discovery means that biological nitrogen fixation can now be observed in detail and should enable scientists to analyze the enzyme chemistry within the living cell, Du Pont pointed out.

When the bacterial processes are understood, one potential practical use is that man may be able to duplicate them economically or stimulate them artificially to increase farming efficiency. This knowledge may also advance the study of catalytic reactions in general.

The researchers also demonstrated that in bacteria of the type studied, the end product of the fixation process is ammonia. This observation confirms some previous theories and will help in future work.

The experiments were facilitated by using "heavy" nitrogen, a rare form of the gas, in a technique developed by Profs. R. H. Burris and P. W. Wilson of the University of Wisconsin.

Named Vice President Of Machinery Firm

PROVIDENCE, R.I. — Lyndus E. Harper was elected a vice president of B-I-F Industries of Providence, R.I. at a recent meeting of the board of directors. B-I-F manufactures a complete line of blenders, meters, feeders and controls for the positive control of materials in motion in water and waste treatment plants and other process industries.

Mr. Harper has been associated with B-I-F since 1944 when Omega Machine Co. became a part of B-I-F Industries, and retains his position as president of Omega in addition to his new duties.

Marco Chemicals Names New Plant Manager

CLINTON, ILL. — Virgil T. Harbach, formerly a sales representative for the Nitrogen Division of Allied Chemical Corp., has been named plant manager of Marco Chemicals, Inc., Clinton, wholesale fertilizer manufacturer.

Virgil T. Harbach

Mr. Harbach received his B.S. in general agriculture in 1948. During the years 1948 to 1955 he taught agriculture at Earlville High School, Earlville, Ill. In 1955 he received his master's degree in agriculture from the University of Illinois. Since that time he was with Allied.

Mr. Harbach whose home at the present time is Freeport, Ill., is married and has three children.

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Dow to Invest $30 Million At Its Louisiana Division

MIDLAND, MICH.—A $30 million expansion program at The Dow Chemical Company's Louisiana Division, Plaquemine, La., has been announced by Dr. Leland I. Doan, Dow president.

The construction will include a plant for the production of ammonia, increases in production capacity for chlorine, and other chemicals.

The expansion will take place over the next two years. Construction will begin at once with completion and start-up scheduled for late 1961 and early 1962.

The company has an expansion project now in progress at Plaquemine, involving an investment of about $12 million. When completed, the expansion just announced will bring Dow's total investment at Plaquemine to more than $100 million, Dr. Doan said.

The new ammonia plant will make both anhydrous and aqueous ammonia. A principal use, based on its high nitrogen content, is in fertilizer.

Dow began development of its Louisiana Division late in 1956. The site, on the west bank of the Mississippi River about two miles north of Plaquemine, includes approximately 1,900 acres. About 500 acres are presently in use.

Made Sales Supervisor

LOS ANGELES—Thomas J. McCaffrey has been appointed sales supervisor, Los Angeles area, agricultural chemicals division, Stauffer Chemical Co. Mr. McCaffrey was formerly administrative assistant to the regional sales manager. A graduate (Bachelor of Science, Agriculture) of California State Polytechnic College, Mr. McCaffrey joined Stauffer in 1953.

PATENTS

Continued from page 16

zene hexachloride isomers of the halogenated hydrocarbon phase and containing less than 4 percent by weight of delta isomer in a second pair of immiscible solvents for benzene hexachloride, said second pair being substantially free of delta isomer and comprising a polyhydric alcohol solvent and a liquid halogenated hydrocarbon solvent, forming third and fourth liquid phases containing dissolved benzene hexachloride, the halogenated hydrocarbon solvent predominating in the third phase and the alcohol solvent predominating in the fourth phase, adjusting the relative volumes of the aliphatic polyhydric alcohol and halogenated hydrocarbon and selectively distributing the gamma isomer in the polyhydric alcohol fourth phase and selectively distributing the alpha isomer in the third phase, and separating the third and fourth phases, the concentration of gamma isomer in the solute of said fourth phase being greater than the gamma isomer concentration in the benzene hexachloride isomeric mixture dissolved in said second pair of solvents.

2,927,001

Production of Ammonia and Sulfur-bearing Materials from Ammonium Sulfate. Patent issued March 1, 1960, to Robert F. McCullough, Glenview, Ill., assignor to the United States of America as represented by the U.S. Atomic Energy Commission. The method of successively producing relatively pure gaseous ammonia and relatively pure gaseous oxides of sulfur by decomposing sulfates of ammonia which comprises mixing metal oxide reactant selected from the group consisting of nickel oxide, strontium oxide, and zinc oxide, with the sulfate and heating the mixture to a temperature within the limits of the range of about 300° C. to about 1200° C., the temperature of the solids being raised in at least two distinct stages so as to separately evolve ammonia and oxides of sulfur and recycling the resultant metal oxide solids to the mixing operation.

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Phillips Develops New Plastic Bag Material

BARTLESVILLE, OKLA.—Phillips Chemical Co. has announced development of a new tailored plastic resin useful in the manufacture of flexible packages. The new-type resin, called "Marlex TR-101" produces a film which Phillips says has a burst strength superior to conventional polyethylene or other types of bags. The makers claim that seven mil bags made from the new resin have a burst strength greater than containers made from 10 mil polyethylene.

The makers point out savings in both weight and cost for the new type bags. Phillips predicts that bag producers will make from 12 to 15 million bags from the material in the next year. Extensive tests have been made with such bags, with numerous cross-country test shipments of over 10,000 filled bags. These, the makers say, showed a breakage of less than a half per cent.

Phillips says that such bags are considered particularly useful for packaging ammonium nitrate and other fertilizer materials.

SURVIVES HANDLING TESTS — This bag, made of "TR-101", a new tailored resin produced by the Phillips Chemical Co. and extruded into plastic film, is claimed to possess unusual sturdiness and resistance to moisture and acids. Seven mil film in TR-101 is said to have 2½ times the burst strength of 10 mil conventional polyethylene and 38% more tensile strength, according to Phillips.

Safety Committee Plans Handbook and More Safety Schools

LAKELAND, FLA.—Plans for the publication of a fertilizer industry safety handbook and also for a supervisory safety training project were formulated at the recent meeting of the executive committee of the fertilizer section of the National Safety Council here.

Suggestions for these two projects were presented by Elmer Perrine, Nitrogen Division, Allied Chemical Corp., chairman of the section. The handbook will cover all safety measures needed in a fertilizer plant, the chairman said. Details of the contents will be worked out by John E. Smith, safety director of Spencer Chemical Co., Pittsburg, Kan.

W. C. Creel, safety director of the North Carolina Department of Labor, and chairman of the fertilizer section's supervisory training committee, was in charge of last year's training schools held successfully in five cities. The group voted to continue the supervisory safety training program in 1960, plans of which are to be announced later.

John E. Smith will continue as chairman of this group, with the cooperation of Paul T. Truitt, president of the National Plant Food Institute. Regional directors are: Stratton McCargo, safety director of G.L.F. Soil Building Service for the Northeast; John Smith, safety director of Spencer Chemical Company for the Midwest; Quentin Lee, director of Plant Food Production, Cotton Producers Association, for the Southeast; Orm Chinnock, technical representative, Nitrogen Products, Hercules Powder Co. for the Far West; and Ansel Raney, safety director for Phillips Chemical Co. for the Southwest. Regional directors of the National Plant Food Institute were in charge of arrangements and finances for the meetings in 1959. These NPFI representatives were Z. H. Beers and George Barclay, Chicago; Dr. S. A. Tisdale, Atlanta; Dr. R. B. Bahme, San Francisco; and Dr. R. L. Beacher, Fayetteville, Ark.

"The agendas for the five schools offered a good balance between safety training subjects and supervisory training techniques," Mr. Smith reported. "Outstanding industry safety leaders and well-known professors in college safety work, as well as technical authorities from commercial companies and government officials in the safety field, acted as instructors for the schools. Most of the well-known types of visual aids, featuring National Safety Council materials, were used throughout the meetings. A highlight of each meeting was student participation sessions where questions and answers to practical problems in the fertilizer industry were presented by the students."

The next meeting of the Executive Committee is scheduled to be held on June 9th, 1960, in Raleigh, North Carolina.

FERTILIZER SAFETY GROUP—The executive committee of the fertilizer section, National Safety Council, met recently at Lakeland, Fla. The group announced that a new fertilizer industry Safety Handbook would be issued soon and that the section would sponsor a supervisory safety training project. In the picture, left to right, are: (back row) E. O. Burroughs, Jr., F. S. Royster Guano Co.; Mike Ellison, Mississippi Chemical Co.; A. B. Pettit, W. R. Grace & Co.; James Phillips (visitor), Davison Chemical Co., Division of W. R. Grace & Co.; George Dietz, Fertilizer Manufacturing Cooperative; W. A. Stone, Wilson and Toomer Fertilizer Co.; Frank Gerard, Olin Mathieson Chemical Corp.; Paul T. Truitt, National Plant Food Institute; Stratton McCargo, G.L.F. Soil Building Service; and M. A. Petersen, National Council.

Middle row (left to right): Carl Alkire, Davison Chemical Co., W. R. Grace & Co.; Dr. E. J. Largent, Reynolds Metals Co.; D. W. Flagler, Davison Chemical Co., Division of W. R. Grace & Co.; C. S. Griffith, Virginia-Carolina Chemical Co.; Emerson Jones, Nitrogen Division, Allied Chemical Corp.; Grayson Morris, Southern States Cooperative; John E. Smith, Spencer Chemical Co.; and W. C. Creel, North Carolina Dept. of Labor.

Sitting (left to right): Gaither Newnam, Smith-Douglass Co.; Ansel Raney, Phillips Chemical Co.; and Elmer Perrine, Nitrogen Division, Allied Chemical Corp.

Record Monthly Lime Totals Noted by USDI

WASHINGTON—For the first time in history, the monthly production of open-market and captive lime passed 1 million tons in December, 1959. This record output of open market and captive lime, 1,001,314 short tons, was 21% above the previous month's total, reported the Bureau of Mines, U.S. Department of the Interior.

Lime output totaled 9,310,527 short tons in 1959, compared to 7,747,616 tons in 1958. An all-time record was established, exceeding the previous annual record high, set in 1956, by 1.5%.

Consumption during 1959 increased in all use categories except agriculture, which was down 5%.

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PRODUCTION COSTS

Continued from page 2

cost estimates for both the solid and liquid grades are conventional in the sense that they utilize raw materials that are commonly used and readily available. The formulations for solid fertilizer products are typical of those in the area for nongranular fertilizer of the grades considered. A limited number of conventional materials are utilized and their delivered costs at the hypothetical plant sites are considered in developing the cost estimates for the grades considered.

The materials used in the formulations for dry mixed fertilizer are ammonium sulfate, ammonia-ammonium nitrate solutions, normal superphosphate, concentrated superphosphate, muriate of potash, and filler. Materials utilized in the preparation of mixed liquid fertilizer are anhydrous ammonia, urea-ammonium nitrate solution, electric-furnace phosphoric acid, muriate of potash, and water.

Four sites were selected for the hypothetical plants in the Southeast. They are Decatur, Ala.; Moultrie, Ga.; Hopkinsville, Ky.; and Goldsboro, N.C. These sites were selected because they are within areas of intensive fertilizer use on principal cash crops, and are, therefore, representative of locations of good fertilizer marketing potential. The grades selected for the cost estimates are those used in considerable quantity in those areas and/or are recommended by the land grant college extension service for use on cash crops in those areas. In some cases, lower grade liquid fertilizers in the same ratio as for the solid grades are used in the cost analysis due to the salting-out problem encountered with higher grade liquids.

Estimated raw materials, operating, and distribution costs at the four sites are summarized in Table I. Because of the difference in grades between some of the solid and liquid products of the same ratio, over-all comparisons are based on cost per unit of plant nutrient.

In summary, the cost analyses comparing solid grades in bags to liquid grades produced in the hypothetical plants at the four locations and delivered to the farm lead to these conclusions: (1) the costs of producing and distributing solid grades in the Southeast are usually less than for comparable liquid grades, and (2) the liquid grades having a low nitrogen to P_2O_5 ratio are more costly to produce than corresponding solid grades. However, as the ratio of nitrogen to P_2O_5 approaches a one-to-one ratio, the cost difference decreases and then disappears.

The chief reason that the costs of liquid grades of low nitrogen content usually are higher than for corresponding solid grades is the high per unit cost of P_2O_5 in electric-furnace phosphoric acid used in the liquid formulations. This acid delivered at the sites considered ranges in price from $1.76 to $2.00 per unit of P_2O_5. Normal superphosphate used to provide P_2O_5 in the solid formulations, on the other hand, ranged from $0.93 to $1.20 per unit.

The reason that the costs of the high nitrogen to P_2O_5 solid grades considered in this study are generally not greatly different from the costs of the high nitrogen to P_2O_5 liquids is that, in the formulations used for solid grades, the nitrogen required above that supplied as ammoniating solution is supplied as ammonium sulfate, which costs from $1.80 to $2.14 per unit of nitrogen. On the other hand, the supplemental nitrogen for liquid grades of a high nitrogen to P_2O_5 ratio is supplied as urea-ammonium nitrate solution which costs from $1.34 to $1.43 per unit depending on the location of the plant.

These cost conditions for phosphate materials and supplemental nitrogen materials account principally for the changes in relative costs between solid and liquid grades as we change from low to high nitrogen to P_2O_5 ratios.

In developing the foregoing analysis, an attempt has been made to utilize conventional equipment, formulations, and practices to estimate meaningful cost comparisons between solid and liquid grades for the Southeast. From a cost viewpoint alone, the advantage appears to favor solids. The authors recognize that this is only one of the criteria for assessing the future for liquid fertilizers. The merchandising and convenience aspects of liquids afford additional yardsticks for determining their potential.

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8-60

Swift Announces New Product Line

CHICAGO—A line of eight new and improved lawn and plant food products was announced by the Vigoro Research Division of Swift & Co.

"These new products are designed for ease of handling, and the new lightweight formulas are concentrated. Each product is tailored to the specific requirements of the various kinds of plant material found in the home yard," said A. H. Bowers, chief agronomist.

For lawn use, a lawn starter and a complete lawn food now provide 5 000 sq. ft. of coverage with the contents of a single bag, at a cost considerably lower than other turf foods. Also on the market is lawn food with soil insect killer added to control ants, beetle grubs, wireworms, etc.

The "pink" plant food now is lighter in weight and its plant food content has been increased by 30%.

The other new products for the garden include a 3-lb. package line of rose food, azalea and camellia food, bulb food, and a new-this-season evergreen food fortified with extra iron.

Warehouse Completed

CAIRO, OHIO—The completion of a bulk and bagged fertilizer warehouse here for the American Agricultural Chemical Co. has been announced by R. F. Cagley, manager.

The warehouse is located about three miles east of New Knoxville and will be operated by Roger Bambauer.

A complete line of bagged fertilizers and a truck spreading service are available.

FERTILIZER

Continued from page 6

nia plants are on stream with an estimated capacity of 4.1 million tons of N. Only two new plants have come into production during this fertilizer year. One other plant under construction may be on stream before June 30, 1960. Plans for the construction of two more plants were announced recently.

By-product ammonia capacity is estimated to have been 220,000 tons of N on January 1, 1960.

Table 1—Nitrogen: Estimated Supply of Nitrogen for Fertilizer Purposes, 1958-59 and 1959-60, U.S. and Possessions

Item	(1,000 short tons of N) 1958-59*	1959-60
Supply from domestic sources		
Solids:		
Ammonium nitrate†	415	439
Ammonium sulfate†	364	346
Urea	115	131
All other solids	208	238
Total solids	1,102	1,154
Liquids:		
Ammonia (including aqua)	827	925
All other	770	895
Total liquids	1,597	1,820
Total (solids and liquids)	2,699	2,974
Imports		
Ammonium nitrate	77	45
Ammonium sulfate	38	60
Urea†	14	19
Ammonium nitrate-limestone mixtures	26	26
Sodium nitrate	72	76
All other	67	90
Total	294	316
Exports		
Ammonium nitrate	31	25
Ammonium sulfate	86	80
Urea	38	16
Ammonia (including aqua)	38	62
All other	30	36
	223	219
Net domestic supply	2,770	3,071

*Revised.
†Adjusted for estimated quantity going into non-fertilizer uses.

Fourteen urea plants are on stream with an estimated capacity of 840,000 tons of urea. Another plant, now under construction, will swell the total to 913 000 tons before the end of the fertilizer year.

Plants now producing solid fertilizer grade ammonium nitrate in the United States number 19. Four domestic plants are now equipped to produce ammonium nitrate-limestone mixtures.

It is estimated that supplies of P_2O_5 for 1959-60 will total 2,761,000 tons, or 3.6% more than were available in 1958-59.

Normal and enriched superphosphate supplies will be smaller than they were last fertilizer year unless production is accelerated to fill P_2O_5 needs for less available concentrated products. Even though the supply of concentrated superphosphate is expected to be larger this year than last, this material is in tight supply and may be very short during the season's peak.

Ammonium phosphate supplies as such will be up about 63,000 tons of P_2O_5.

Other phosphates will be up about 52,000 tons of P_2O_5, principally as ammonium phosphate produced in combination with potassium salts and phosphoric acid for direct application and mixtures (liquid and solid). Imports of other phosphates are expected to be about two-thirds those of last year.

Table 2—Phosphate: Estimated Supply of P_2O_5 for Fertilizer Purposes, 1958-59 and 1959-60, U.S. and Possessions

Item	(1,000 short tons of available P_2O_5) 1958-59*	1959-60
Supply from domestic sources		
Normal and enriched superphosphate	1,480	1,346
Concentrated superphosphate	900	916
Ammonium phosphate†	186	227
All other‡	318	378
Total	2,804	2,867
Imports		
Ammonium phosphate	42	69
All other	22	15
Total	64	84
Exports		
Normal superphosphate	36	29
Concentrated superphosphate	143	130
Ammonium phosphate	15	20
All other	10	11
Total	204	190
Net domestic supply	2,664	2,761

*Revised.
†Liquid and solid ammonium phosphate shipped as such by primary producers.
‡Includes ammonium phosphate (produced in combination with potash salts to make mixed fertilizers), nitric phosphates, sodium phosphate, wet base goods, calcium metaphosphate, natural organics, phosphate rock and colloidal phosphate, basic slag and estimates of wet and furnace phosphoric acid for liquid and solid mixed fertilizers and direct application.

Phosphoric acid (wet and furnace) in 1958-59 totaled an estimated 138,000 tons of P_2O_5, less than anticipated mid-way of last season. For 1959-60, the total is expected to be about 194,000 tons, a net increase of 56,000 tons. Elemental phosphorus and furnace acid contributed in all forms an estimated 166,000 tons of P_2O_5 to fertilizer supplies last year. The total this year is expected to be about 171,000 tons. Furnace acid as such for fertilizer purposes is in tight supply and is expected to be very short during the spring rush.

Plants under construction and proposed projects may result in a sizeable expansion of P_2O_5 capacity based on wet process acid. Several of the projects are to increase capacity and/or provide flexibility in operations which will enable producers to supply P_2O_5 in the form desired by the trade whether it be phosphoric acid, concentrated superphosphate, or ammonium phosphate.

Producers of elemental phosphorus are expanding facilities and one furnace acid plant is under construction. How much of the increased supply will be available for fertilizer purposes has not been indicated.

Deliveries during the first six months of the fertilizer year indicate that net domestic potash supplies in 1959-60 will total 2,253,000 tons of K_2O, about the same level as last year.

Graduated price discounts were in effect during the first six months, changing bi-monthly for potassium chloride (muriate) and quarterly for potassium sulfate. In each month just prior to the bi-monthly discount reduction (increase in price), deliveries of muriate were about twice the movement in the previous month. However, total domestic deliveries in

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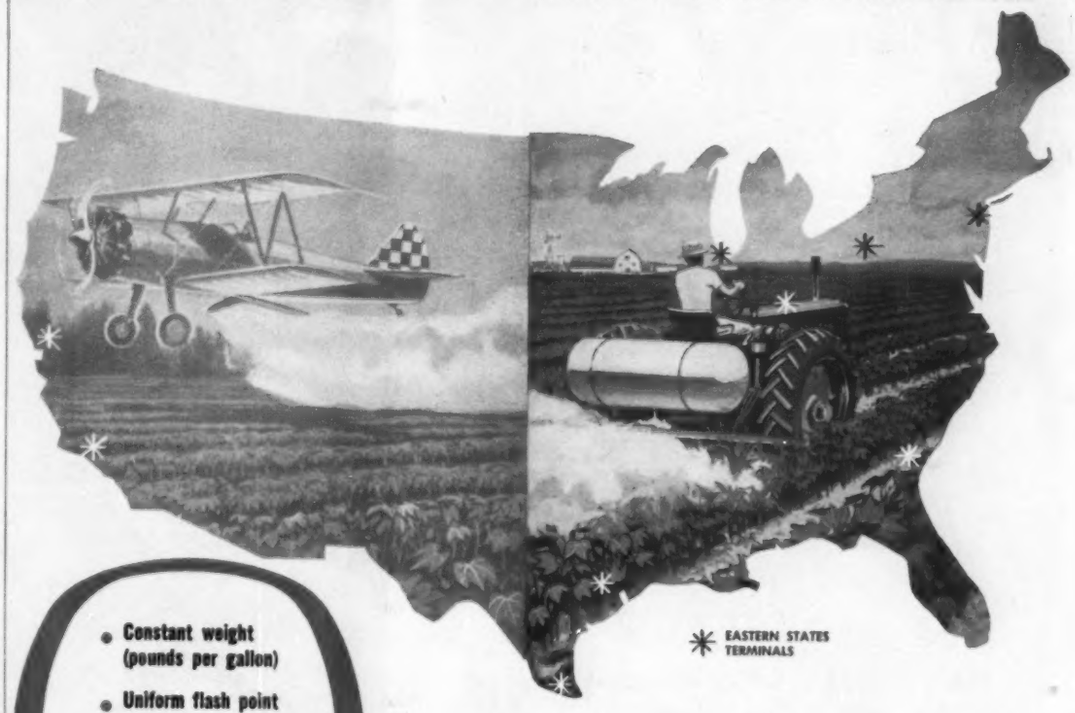

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the first six months were at an annual rate about 38,000 tons of K_2O below 1958-59. Potassium sulfate deliveries were at a rate about 7,000 tons above that of last year.

Table 3—Potash: Estimated Supply of K_2O for Fertilizer Purposes, 1958-59 and 1959-60, U.S. and Possessions

Item	(1,000 short tons of K_2O) 1958-59*	1959-60
Supply from domestic sources		
Potassium chloride	2,100	2,205
Potassium sulfate†	123	127
All other	20	20
Total	2,323	2,352
Imports		
Potassium chloride	177	218
Potassium sulfate†	37	35
All other	24	18
Total	238	271
Exports		
Potassium chloride	284	346
Potassium sulfate	17	14
All other	9	10
Total	310	370
Net domestic supply	2,251	2,253

*Revised.
†Includes sulfate of potash-magnesia.

Producers' inventories of potash are lower than they have been during the two previous years, and deliveries in the last six months will be more dependent on current production than in the past. Inventories at the end of the year will be even lower than at present if indicated deliveries for domestic use and export are maintained.

Potash imports have been greater than in the corresponding period a year ago. Even though East Germany announced last spring that it was withdrawing from the United States market, recent news items indicate that the Soviet Union is joining West Germany, France and Spain as a supplier of potash. The reported price of Soviet Union potash, which is lower than French or West German prices, appears attractive to East coast fertilizer manufacturers. The advantage of imported potash disappears rapidly farther inland. Exports are expected to be 60,000 tons of K_2O larger than those a year ago.

Estimated domestic production capacity is about 2,500,000 tons of K_2O. No new production came in during 1958-59 nor is any expected during 1959-60.

Production difficulties were encountered at the Canadian potash facilities. The plant which had started production is down and any production in Canada during the current fertilizer year is not likely.

Western Agricultural Chemicals Meeting Planned

PALM SPRINGS, CAL. — The Western Agricultural Chemicals Assn. will convene in its 31st annual meeting here Sept. 24-26, 1960, according to C. O. Barnard, executive secretary. Meeting headquarters will be at the Palm Springs Riviera Hotel.

Tennessee Corp. Plans New Florida Facility

EAST TAMPA, FLA.—Tennessee Corporation has announced that it will build an ammonia plant costing $11 million at East Tampa. The unit, when completed early in 1962, will have a capacity of 100,000 tons a year, the company said.

Tennessee Corp. has made an agreement with Southern Nitrogen Co. whereby the latter will purchase some 30,000 tons of the ammonia each year. (Croplife Feb. 22, page 1)

Remaining tonnage will be used by Tennessee Corp. for manufacture of its own phosphate and nitrogen fertilizer material, "Di-Mon." Facilities for making "Di-Mon" are being expanded to the extent of $1.1 million at East Tampa, the company says.

Plant Explosion Kills One, Injures Eleven

NEWARK, N.J.—A chemical explosion and fire at the Diamond Alkali Co. plant here killed one man and injured 11. About 15 men were in the three-story brick building when a chamber allegedly containing tetrachlorol phenol, methanol and a caustic exploded under pressure.

The blast tore off the roof, smashed windows and doors and caused considerable damage to the interior. The loss was expected to reach $250,000.

Cause of the explosion was not determined.

The dead man was identified as Alfred Casatelli, a chemical engineer. John Burton, the plant manager, was in critical condition with a skull fracture, and six others were detained at the hospital for treatment of chemical poisoning.

Herbicides Available

AMBLER, PA.—Amchem Products, Inc., announced the availability of herbicides for experimental use in 1960. These products include: "Amiben" (previously referred to as "Amoben"); "Amitrol-T"; and "Fenac."

Information on Amchem herbicides available for commercial uses in 1960 will be reported separately at timely intervals.

PESTICIDE PROLOGUE—Gov. Gaylord Nelson of Wisconsin, left, confers with Lea S. Hitchner, executive secretary of the National Agricultural Chemicals Assn. at the Wisconsin capitol in Madison recently. The occasion was brought about by the Governor's calling together the members of a special committee to survey the use of chemicals in agriculture. Objectives of the committee are to study the effects of pesticides and chemical additives on public health. (Croplife March 7, page 1) The group expects to develop groundwork for a decisive and consistent public policy in respect to regulating the use of chemicals as feed supplements, food additives, pesticides and growth regulators. The committee is composed of authorities in the fields of agriculture, chemistry, biology and public health.

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Dr. Moyle S. Williams Joins Sulphur Institute

WASHINGTON — Dr. Moyle S. Williams has been appointed chief economist of The Sulphur Institute, it was announced by Dr. Russell Coleman, president of the newly-formed research organization. Dr. Williams presently is chief economist of the National Plant Food Institute. He will assume his new position on March 16 and will be located at the Institute's headquarters at 1725 K Street, N.W., Washington, D.C.

Dr. Williams will be in charge of economic research and development for the new Sulphur Institute, whose principal purpose is to expand world consumption of sulphur through research and education programs. He also will serve as economic advisor to the Institute staff, and will provide liaison between the Institute and professional organizations and institutions concerned with economic research in both the industrial and agricultural fields.

Before joining the National Plant Food Institute in 1956, he was specialist in charge of the extension farm management and marketing department at North Carolina State College. He holds B.S. and M.S. degrees in agricultural economics from North Carolina State College, and received his doctorate, also in agricultural economics, from Purdue University in 1954. With the National Plant Food Institute, he has been responsible for developing and carrying out a program of research and education in the economics of fertilization.

Dr. Williams is a native of North Carolina. He is a member of a number of professional and scientific organizations including the American Farm Economics Association and the American Society of Farm Managers and Rural Appraisers.

Entomological Branch Elects New Officers

BATON ROUGE, LA.—I. J. Becnel, Freeport Sulphur Co., New Orleans, was elected chairman of the Southeastern Branch of the Entomological Society of America at its 34th annual meeting in Savannah, Ga., recently.

Other officers are: C. N. Smith, U.S. Department of Agriculture, Orlando, Fla., chairman-elect; John S. Roussel, Louisiana State University, Baton Rouge, secretary-treasurer; L. D. Newsom, Louisiana State University, representative of the governing board, and R. J. Kowal, USDA, Asheville, N.C., and Gordon Barnes, University of Arkansas, Fayetteville, Ark., members of the executive committee.

NAMED VICE PRESIDENT

HOUSTON, TEXAS—Gulf Sulphur Co. has announced the appointment of Robert H. Allen as vice president. The new appointee has been with Gulf Sulphur since 1957, and was formerly secretary-treasurer of the company.

DuPont Sales Rise

WILMINGTON, DEL.—Sales of the Du Pont Co. advanced 16% in 1959 over 1958 and established a record for the company of $2,114 million, passing the two-billion mark for the first time. The previous record was $1,965 million established in 1957.

Crawford H. Greenewalt, president, in his annual report to the more than 217,000 stockholders, also disclosed that the company's index of selling prices averaged about 1% lower than in 1958. It was 6% lower than in 1954 and was only 4% above the 1947-49 average.

Moved to Los Angeles

LOS ANGELES—American Potash & Chemical Corp. has transferred Dean L. Browne from its Lindsay chemical division in West Chicago, Ill., to the firm's Los Angeles office it was announced by J. N. Hinyard, director of market development. Mr. Browne, who was formerly market development representative for Lindsay division, has assumed the same responsibilities in the company's market development program.

Allis-Chalmers Appoints

MILWAUKEE—The scheduled retirement July 1, 1960 of F. C. Ludington, manager of the Allis-Chalmers Manufacturing Co. control department, has resulted in the appointment of D. B. Scott as his successor effective March 1. Mr. Ludington has been associated with Allis-Chalmers since 1923. He became manager of the control department in 1945 and was manager of Allis-Chalmers Hawley Works from 1951 to 1955. He will serve as a consultant until his retirement. Mr. Scott joined Allis-Chalmers in 1937. He was named assistant manager of the rectifier section in 1955 and manager three years later.

D. S. Aitken Dies; Was C-I-L Manager

CHATHAM, ONTARIO — Funeral services for D. S. Aitken, 69, former Chatham district sales manager of the agricultural chemicals division of Canadian Industries Ltd., were held March 3 from the chapel of the George Fennel Funeral Home, Chatham.

Born in Glasgow, Scotland, Mr. Aitken came to Canada in 1911 and established a fertilizer manufacturing business with a brother in Vancouver. He joined the C-I-L fertilizer sales staff in 1935 and was transferred to the Chatham district as sales manager in 1937. He retired from the company in 1957.

NEW LOCATION

ATLANTA, GA.—The Atlanta regional office of U.S. Borax & Chemical Corp. has moved to 1627 Peachtree St., N.E., Atlanta 9.

Old Dobbin and the walking plow were indispensable in the early days of cultivating our land.

Engine power has replaced "horse power," making possible bigger farms, better tillage, more economical farming.

FERTILIZER PLANTS HAVE MODERNIZED, TOO

Just as Old Dobbin and the walking plow have given way to modern tractor plowing, so, too, has fertilizer manufacturing been improved. Today, fertilizer manufacturing employs precise, scientific techniques incorporating modern equipment and chemical engineering know-how.

If you have agronomic or fertilizer manufacturing problems, or are looking for new information on improved techniques for more economical production, just call on Texaco for help and suggestions. Our Technical Service people in these fields have a wealth of experience in agronomy and fertilizer manufacturing, both in research and practice.

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PRODUCTION EDITION

Editorial

British Fertilizer Industry Is Given Clean Slate After Monopoly Commission's Report

FERTILIZER PRODUCERS in Great Britain emerged with a clean bill of health following a recent study by that country's Monopolies Commission to determine whether the makers of plant food were playing in accordance to the rules.

Because the fertilizer industry in the United States has from time to time been under the suspicious eyes of various people and governmental agencies, it is refreshing to see a favorable outcome following an all-out investigation of the British industry.

Naturally, there are many differences in modes of operation between the American fertilizer manufacturer and his British counterpart, but the basic problems of production and marketing are about the same and similar laws govern the activities of the industries.

The American fertilizer industry, ridiculous as it may seem to those who know the severe competitive situation, has been threatened numerous times with investigations into "price fixing," whereas the chief worry of the hundreds of individual companies in the field is how to keep from going under due to extremely slim profit margins. This situation may not be as acute in England, which may have encouraged the Monopolies Commission to take a look-see.

Basically, the Commission was given two main tasks. It had to decide whether a situation of monopoly existed within the industry, and if so, whether the situation operated against the public interest. English law says that monopolistic conditions are deemed to prevail if any one company supplies more than one-third of the market for a particular product.

Two firms were under direct scrutiny. These were Imperial Chemical Industries (ICI) and Fisons. Although each company enjoys about a third of the available market, the Commission did not, in general, consider this an unsatisfactory situation. There are historical and economic reasons for this attitude, it pointed out.

The Commission recognized the large amounts of capital and research required, and referred to the "enormous economies" to be had in large scale operations. Such savings, it indicated, may be passed on to the consumer.

In commenting on ICI, the Commission said this firm had shown "A conscientious regard for the public interest" in the development and conduct of its fertilizer business.

Both ICI and Fisons must depend on imports for their supplies of potash, of course.

Although these two firms account for two thirds of the total fertilizer business of the country, they are not without competition. Shell Chemical Corp. and Lawes Chemicals are also in the picture to an increasing extent.

We trust that any person or persons bent on giving the American fertilizer industry a going over on the basis of "monopolistic" practices, will keep in mind the findings of the British Commission on Monopolies where just two firms account for over 66% of the nation's supply of plant food products. With the 25-million-ton U.S. market spread widely over hundreds of firms, the physical possibility of any kind of monopoly appears most remote.

If just two British firms doing two-thirds of the business get a clean bill of health, the U.S. companies supplying farmers with valuable plant food at low cost and under the strictest kind of competition, should have nothing to worry about.

★ ★ ★

WHETHER A RECENT scientific "breakthrough" achieved by scientists of E. I. du Pont de Nemours & Co. will eventually have any effect on the nitrogen industry, will probably require a long time to be seen. The researchers have duplicated in a test tube the reaction used by nature within living cells to create nitrogen compounds. Up to now, it had not been possible to separate nitrogen-fixing chemicals from bacteria so that the function might be continued outside the bacterial cell.

Scientists have been searching since the middle of the nineteenth century, for the secret of nature's method of fixing nitrogen. It has been generally assumed that the act is performed by enzymes, but this supposition was difficult to prove because it was impossible to extract them from living cells without destroying them.

The work done by researchers Dr. James E. Carnahan, Dr. Leonard E. Mortenson, Dr. Howard F. Mower, and Dr. John E. Castle overcame this long-time barrier and made it possible to observe long-time barrier.

It will be a long time . . . if ever . . . before this discovery and subsequent findings will be felt in any way by the nitrogen-producing industry. But at the same time a breakthrough, as basic as this one seems to be, can lead in surprising directions.

★ ★ ★

FERTILIZER COMPANIES doing business in the State of South Carolina should keep in mind a recent ruling dealing with coloration of inert fillers in fertilizers. This ruling was made by the Board of Trustees of Clemson College, sitting as the state's fertilizer board of control.

Following is the full text of the statement to all fertilizer manufacturers operating in South Carolina. It was signed by Dr. Bruce D. Cloaninger, director of the fertilizer inspection and analysis service of South Carolina:

"1. That any inert filler which bears a color similar to recognized materials furnishing primary, secondary, minor, or trace nutrients is deemed and declared objectionable as a component of any mixed fertilizer, in that its use has the effect of deceiving the purchaser of the fertilizer and is in violation of Section 10 of the South Carolina Fertilizer Law. (Section 3-590.54, Code of Laws 1952 as amended.)

"2. SCS, SCS 100 clays and yellow ocher are determined to be objectionable within the meaning of the above section. The enumeration of these inert filler materials shall not be considered to be exclusive of such materials that may be determined to be prohibited by the said section.

"3. Fertilizer manufacturers may submit samples of any questionable inert filler material to the Fertilizer Board of Control or its representative for a ruling as to whether its use is objectionable under this regulation.

"4. This regulation shall become effective on July 1, 1960."

Croplife's Home Office

Croplife®
PRODUCTION EDITION

Member of Business Publications Audit — *Member of National Business Publications*

CROPLIFE is a controlled circulation journal published weekly. Weekly distribution of each issue is made to the fertilizer manufacturers, pesticide formulators and basic chemical manufacturers. In addition, the dealer-distributor-farm adviser segment of the agricultural chemical industry is covered on a regional (crop area) basis with a mailing schedule which covers consecutively, one each week, three geographic regions (South, Midwest and West) of the U.S. On the fourth week, production personnel in fertilizer manufacturing and pesticide formulating plants throughout the U.S. are covered in depth. To those not eligible for this controlled distribution, Croplife's subscription rate is $5 for one year ($8 a year outside the U.S.). Single copy price 25¢.

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Classified advertisements accepted until Tuesday each week for the issue of the following Monday.

Rates: 15¢ per word; minimum charge $2.25. Situations wanted, 10¢ a word; $1.50 minimum. Count six words of signature, whether for direct reply or keyed care this office. If advertisement is keyed, care of this office, 20¢ per insertion additional charged for forwarding replies. Commercial advertising not accepted in classified advertising department. Display advertising accepted for insertion at minimum rate of $11 per column inch.

All Want Ads cash with order.

HELP WANTED

ASSISTANT SALES MANAGER—MIDWEST multiple plant operation has opening for aggressive person who desires to use knowledge and skill for advancement. Complete resume, age, experience and availability first letter. Address Ad No. 5716, Croplife, Minneapolis 40, Minn.

MACHINERY FOR SALE

GOOD USED STEEL TANKS — TWELVE 17,000 gal., one 13,000 gal., aluminum lined. Two 12,000 gal., porcelain lined. Priced to sell. L. E. Glick & Co., 626 Broadway, Cincinnati 2, Ohio.

BUSINESS OPPORTUNITIES

DISTRIBUTORSHIPS AVAILABLE FOR Best 4 Brand agricultural chemicals and herbicides. Price, quality and controlled distribution can be yours. Time Chemical Corp., 5321 Dahlia St., Denver 16, Colo.

DISTRIBUTORS—SOME DESIRABLE TERRITORIES now open for highly-profitable Arrow Brand finely-ground rock phosphate—the leader in its field. You will be backed by advertising and complete sales and promotion program. Write Dept. C. Robin Jones Phosphate Company (Est. 1902), Nashville, Tennessee.

To Lease Equipment

CHICAGO—The complete line of "Packomatic" automatic packaging machinery can now be leased for terms up to five years, it was announced jointly by Robert C. Ferguson, president of the J. L. Ferguson Co., Joliet, Ill., manufacturer of the "Packomatic" line, and Robert Sheridan, president of Nationwide Leasing Co., Chicago. Nationwide has contracted to handle leasing arrangements for all "Packomatic" machines.

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Industry Meetings

March 22-23—Western Agricultural Chemicals Assn., spring meeting, Miramar Hotel, Santa Barbara, Cal.

April 11-12—Annual California Fertilizer Conference, Fresno State College, Fresno, Cal.

June 13-18—National Plant Food Institute annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 21-22—Annual meeting, Southern Feed & Fertilizer Control Officials, Riverside Hotel, Gatlinburg, Tenn.

July 13-15—Eleventh annual Fertilizer Conference of the Pacific Northwest, Hotel Utah, Salt Lake City. B. R. Bertramson, State College of Washington, Pullman, Wash., chairman.

July 27-29—Great Plains Agricultural Council, 1960 meeting, Laramie, Wyo.

July 27-30—Southwest Fertilizer Conference and Grade Hearing, Galvez Hotel, Galveston, Texas.

Sept. 24-26 — Western Agricultural Chemicals Assn. 31st annual meeting, Palm Springs Riviera Hotel, Palm Springs, Cal.

Sept. 29-30 — Northeast Fertilizer Conference, Hotel Hershey, Hershey, Pa.

Oct. 5-6—Southeast Fertilizer Conference, Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 17-21—National Safety Congress, 48th annual meeting. Fertilizer Section meets at La Salle Hotel, Chicago.

Nov. 13-15—California Fertilizer Assn., 37th annual meeting, del Coronado Hotel, Coronado, Cal.

Clifford E. Oman

James R. Smith

U.S.I. Shifts Two in Production Appointments

NEW YORK — Clifford E. Oman has been named assistant to the director of production at U.S. Industrial Chemicals Co., Division of National Distillers and Chemical Corp. In his new position he will report to Paul J. LaMarche, U.S.I. director of production.

At the time of his appointment, Mr. Oman was Tuscola general manager with responsibility for operations at U.S.I.'s petrochemical plant complex at Tuscola, Ill. He has been at the Tuscola plant since 1951 when he joined the staff as an area superintendent. Mr. Oman holds a bachelor of chemical engineering degree from the University of Minnesota and was previously employed by Elgin Softner Corp., Atlas Powder Co., and Shell Oil Co.

James R. Smith, plant manager, now assumes full responsibility for Tuscola plant operations. Mr. Smith had been plant manager of U.S.I.'s caustic-chlorine plant at Huntsville, Ala. from 1951 until 1957. He also served as plant manager of U.S.I.'s Zirconium-Titanium metals plant and as a production manager in the New York headquarters before his transfer to Tuscola last year. Mr. Smith had earlier been employed by the Heyden Chemical Co., where he served in various capacities from operator to assistant manager. Mr. Smith obtained his engineering education at Edwards School of Chemistry and Engineering, as well as Murray State College at Murray, Ky.

Chicago Sales Office For Chippewa Plastics

CHIPPEWA FALLS, WIS.—Chippewa Plastics Co., a division of the Rexall Drug and Chemical Co., has established a Chicago sales office, Thomas E. Fritscher, sales manager, has announced.

George N. Keyser

The company's Chicago headquarters, located at 5111 Sheridan Road N. (phone UPtown 8-5053), will supervise sales and service activities for the firm's lines of polyethylene packaging films and polyethylene industrial bags. George N. Keyser, field sales manager, will head the Chippewa Plastics' Chicago office.

Chippewa Plastics pioneered development of the heavy-duty polyethylene industrial bag for the packaging of fertilizers and other products requiring protection from moisture.

CALENDAR FOR 1959-60

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Letter
To the Editor

To the Editor:

As manager of the pesticide manufacturing facility of Swift & Company, currently under construction at Harlingen, Texas, in the Rio Grande Valley, I should like to request that "Croplife" be sent to a number of our people at the earliest possible time.

In my previous location, I found "Croplife" of outstanding value to us in our pesticide marketing work and I shall look forward to receiving it here again so that we may continue this working relationship toward a mutual goal: The better understanding of pesticides.—R. J. Steeno, pesticides sales manager, Swift & Co., Harlingen, Texas.

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Ray keeps a running record of tank cars available, and he knows accurately the schedule of truck shipments. He is thus able to help customers estimate the delivery time on NH_3 and Nitrogen Solutions shipped by truck.

You don't learn this job overnight. Certainly Ray didn't. He's been in the Standard Oil sales department for 22 years. Thirteen of these years have been in customer service work. Many's the time Ray has been on the telephone at home after midnight making sure someone's shipment went through on time.

Is this the attention you would like your purchases of Anhydrous Ammonia and Nitrogen Solutions to receive? Well, it's the kind of care your order gets at Standard. Get all of the facts from your Standard Oil representative. Or write, **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.**

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